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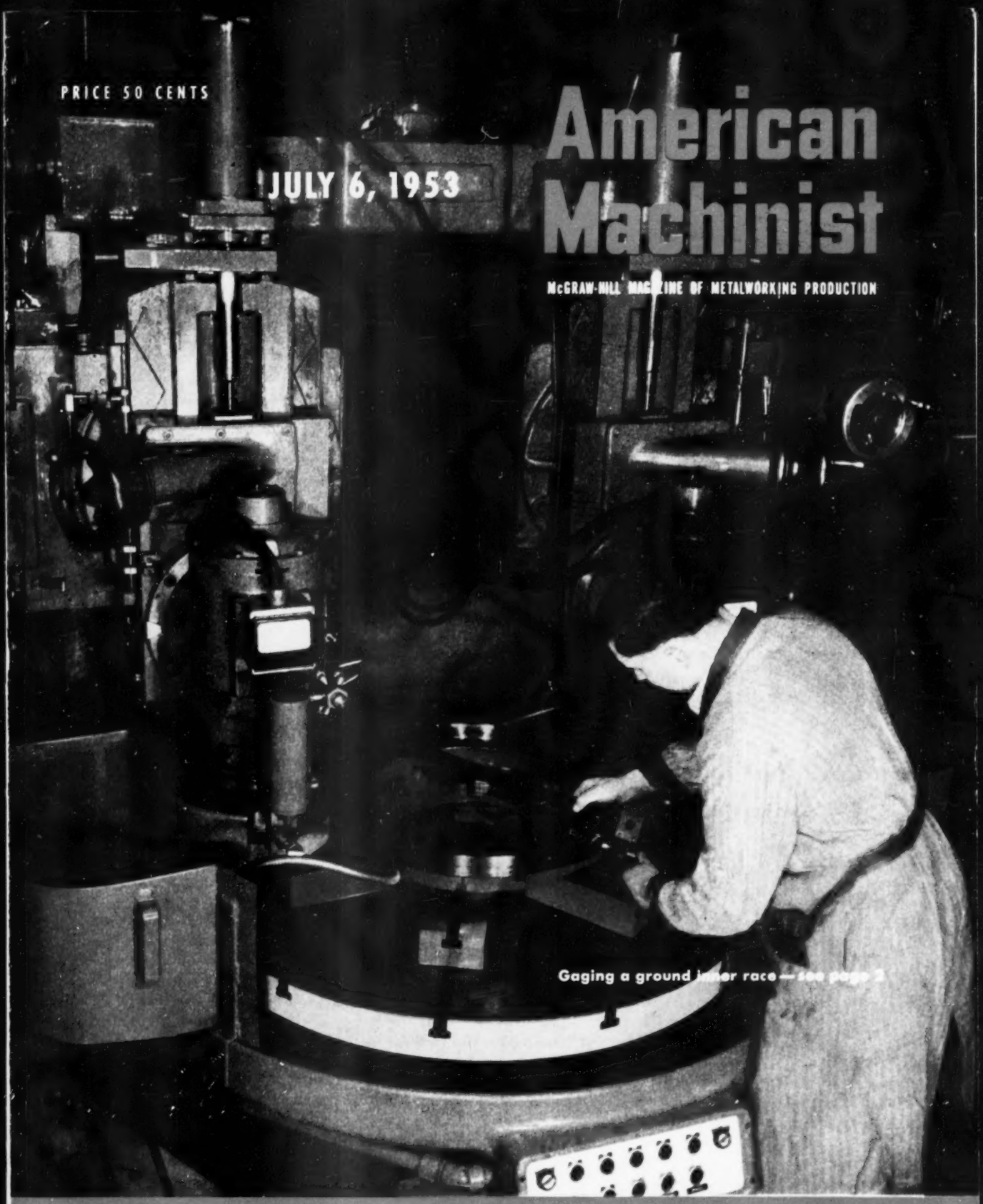
JULY 6, 1953

American Machinist

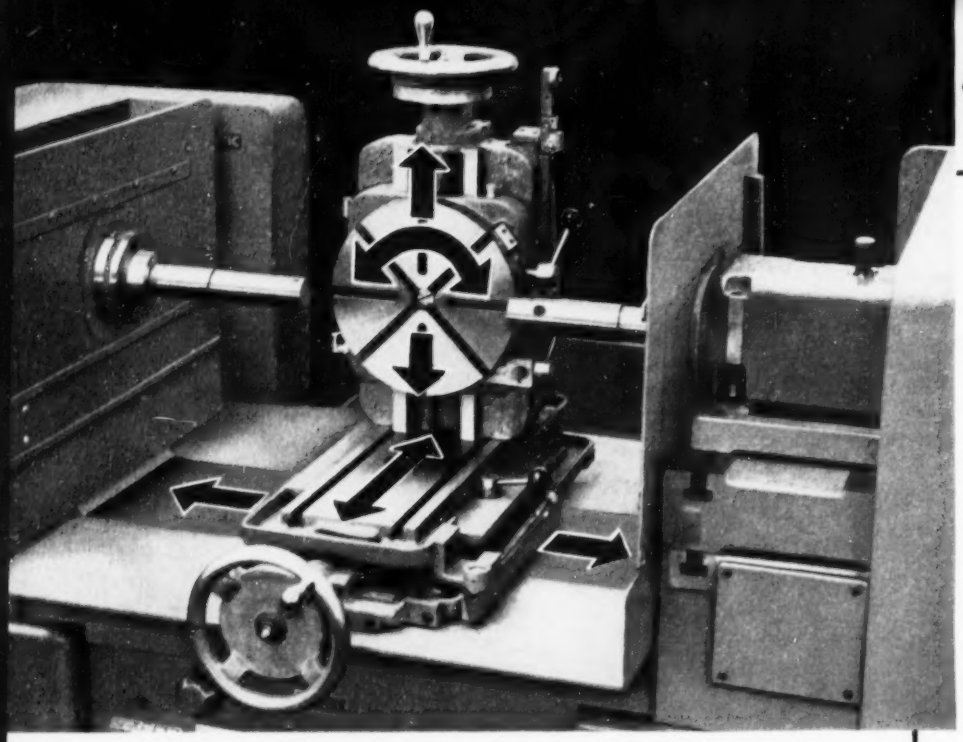
McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION



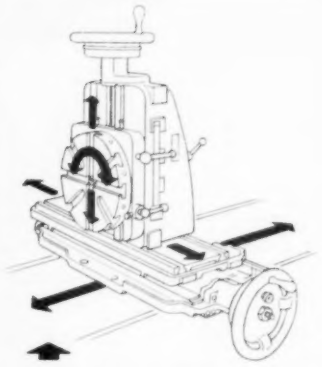
Gaging a ground inner race — see page 2

Impact Extrusion — A SPECIAL REPORT

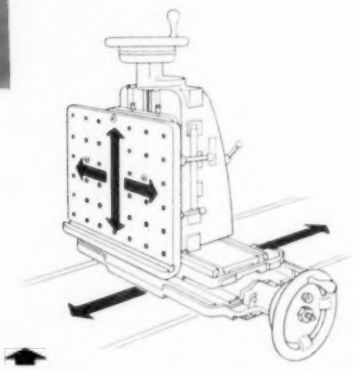
Precision Tumbling . . . Ultrasonic Cleaning



Heald Universal Fixture with rotary indexing face plate permits borizing from both ends on this Heald Model 322 Bore-Matic.



Heald Universal Fixture with rotary indexing face plate mounted parallel to cross slide.



Heald Universal Fixture with rectangular face plate mounted parallel to cross slide.

Here's why the Heald

UNIVERSAL FIXTURE

gives MAXIMUM VERSATILITY for small-lot borizing

The accuracy, finish and economy of Heald Borizing is not limited to long-run jobs with special, custom-built fixtures and tooling. A standard machine, equipped with a Universal Fixture, offers maximum versatility for small-lot borizing on a wide range of miscellaneous parts.

This time-saving Universal Fixture permits indexing of work or tools horizontally, vertically or angularly. Multiple surfaces can be bored, faced or turned with "jig-borer" precision at a single set-up.

The vertical and horizontal slides can be equipped with calibrated handwheels, gage blocks and integral dial indicators for maximum precision of fixture adjustment. This cuts set-up time, speeds change-overs, and permits exact duplication of settings for repeat jobs.

Two styles of Universal Fixture are available — with either a rotary indexing face plate or fixed rectangular face plate for holding the work, tools or auxiliary fixtures. With either type, the face plate can be mounted parallel to the machine table ways or parallel to the cross slide travel. Universal Fixtures are more usually applied to models 221, 321, and 421 (single-end) Heald Bore-Matics. Double-end setups on the two larger size models 322 and 422 have proved successful where circumstances permit.

Ask your Heald representative for complete details on this Universal Fixture. Or write for your copy of Bulletin No. 7-25-1. Remember — when it comes to precision finishing, it pays to come to Heald.

Internal and Rotary Surface Grinding Machines and Bore-Matics

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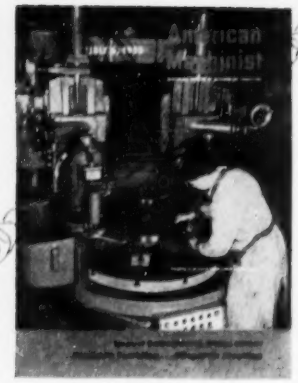


chips

SURFACE SERVICE ... Radar and other accouterments of modern warfare have created the need for unusual processes, unusual materials, and unusual parts. Our front cover pictures such a part in such a process; it shows the inner race for a 25.562-in.-OD ball bearing, quite small in cross-section, being gaged during grinding at Kaydon Engrg Corp, Muskegon, Mich. The machine is a special twin-spindle Frauenthal grinder. More about both is the article on page 145.

DON'T LET 'EM TUMBLE ... make 'em slide. This advice on precision tumbling from Westinghouse Electric Corp, where high-quality finishes without knicks and mars are produced with standard tumbling barrels. The difference in accuracy for those parts that require it is in close control over abrasives and additives—and also the fact that barrels are filled almost full, making the parts slide and tumble a little, but not drop to the bottom. The details are in our lead article this time.

MANUFACTURING COSTS ... They depend a lot on engineering design, as well as production techniques and tooling. A 4-pager in this issue covers Lockheed Aircraft's approach to the problem of getting production and engineering together. Their answer involves the organization of both departments in such a way that production is most economical for the required design strength and weight of product.

NOISY SCRUBBERS ... A new way to clean metal parts—and parts of other materials—is with ultrasonic vibrations. They kick the daylights out of the dirt, but don't harm the parts themselves—not even the surface finish. Best application thus far seems to be high-cost parts requiring absolute cleanliness all over.

DRILL TALES ... Magna drill units were brought out by Production Engineering Co, Berkley, Calif, something over a year ago; but it took the manufacturer himself to come up with a really good set of application examples. PEC uses the drills for making *Shopsmith* home-workshop tools, and has shown very large savings.

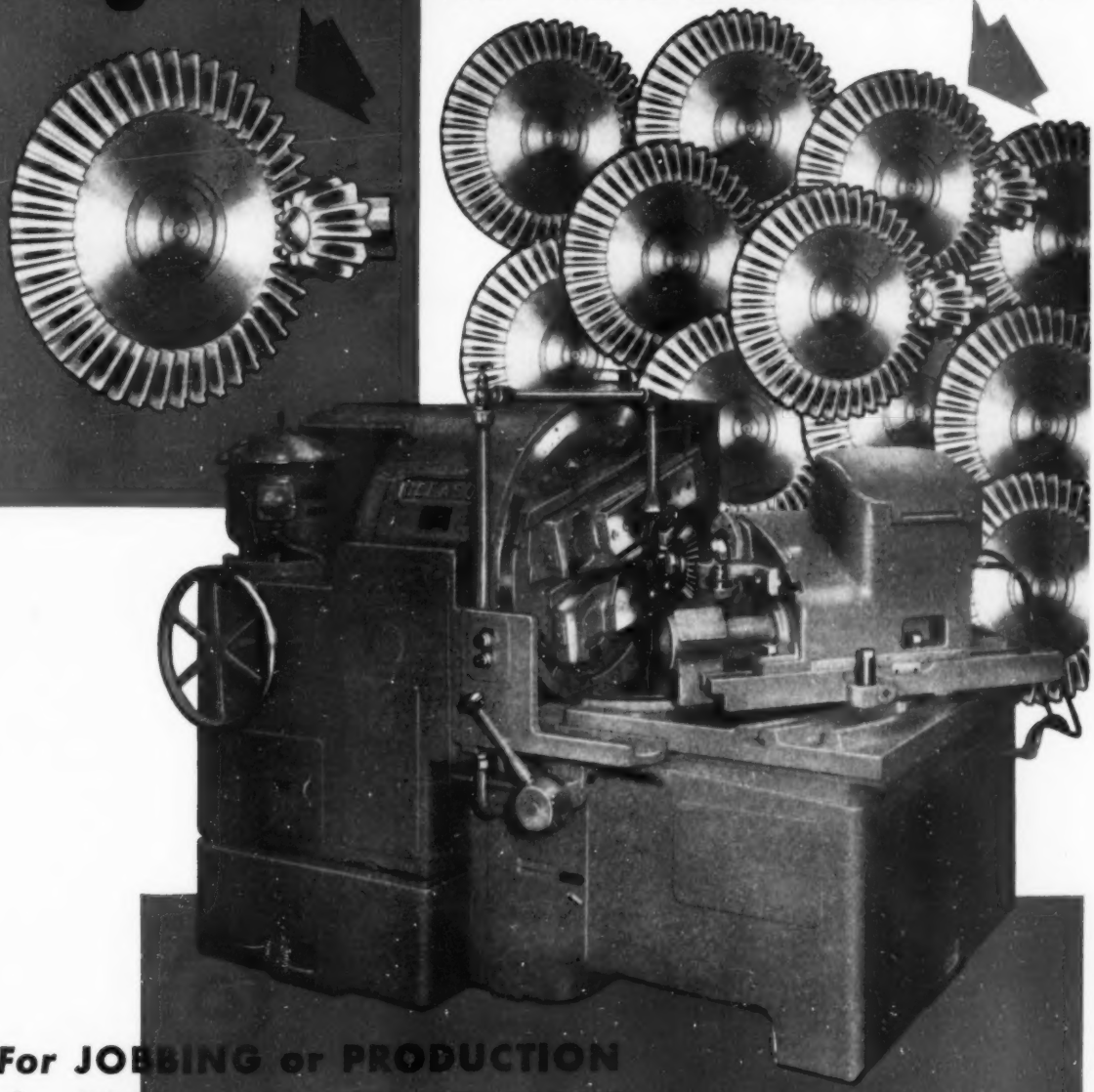
EXTRUSION SECRETS ... The most detailed discussion of the impact extrusion of high-strength aluminum today, is what Associate Editor Ashburn termed the Special Report in this issue. It's a 12-page complete-coverage text, including data on the process, tool design and construction, slug development, lubrication, and production methods proven out at Lockheed Aircraft.

PARTS HANDLING ... An automatic parts-delivery conveyor in the fabricating department of Stewart-Warner, where the parts carrier can be set to be delivered to any one of 12 receiving stations, is covered in a 4-page picture-caption story.

COMING ... *AM* for July 20 will include an 8-page Special Report on cold extrusion of steel—a contrast to that in the current issue on aluminum. It's from an automatic company, too, offering added contrast. There's also a lead article showing a new plant with "frills," and the management's evaluation of them. Other articles deal with coolant for carbides, shaving dies, carbide-tool maintenance, aircraft-frame fabrication, and other processes.

SLIDABRADER . . . Richard DePastina joined Westinghouse Electric Corporation in 1943 as a lab technician. Four years later, he began to be identified with the subject on which he has now become expert—tumbling and "slidabrading"—the latter a coined word for tumbling with the tumble taken out. Now consultant manufacturing engineer with the Headquarters Mfg Engrg Dept in Pittsburgh, Dick describes the slidabrading process in our current lead article.

Single Lots or Thousands...



For JOBBING or PRODUCTION
the GLEASON No. 14 STRAIGHT
BEVEL GENERATOR LEADS THE WAY

It is universal within its range . . . is easily set up and changed from one job to another . . . equipped with double track cam for roughing and finishing . . . handles gears up to 24" pitch diameter in large or small quantities.

Write for leaflet and see how the No. 14 Straight Bevel Generator will fit your requirements.

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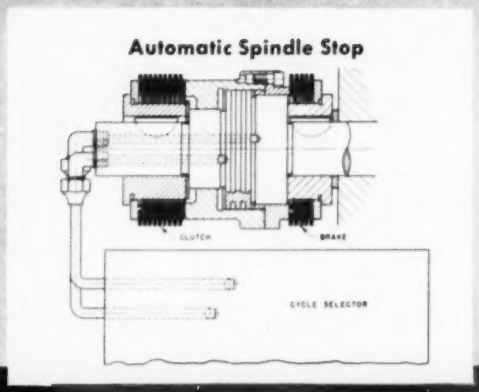
Designed to meet your milling requirements . . .



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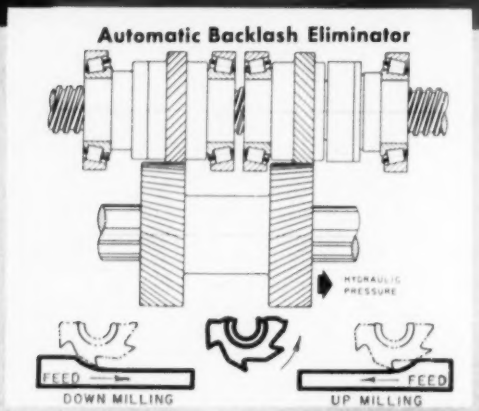
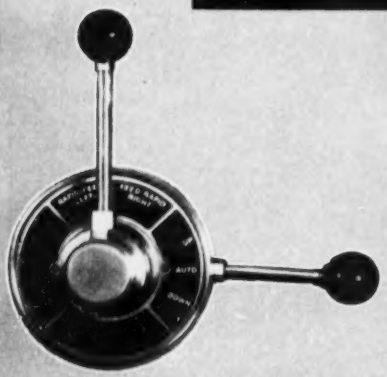
NO. 2-24 AUTOMATIC MILLING





Control Levers . . .
Table and Spindle Carrier

CINCIN

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES • METAL FORMING MACHINES • FLAME HARDENING MACHINES • OPTICAL PROJECTION PROFILE GRINDERS • CUTTING FLUID

Dynapoise Overarm

Opposite sides of pump spacers are milled in this set-up on a new CINCINNATI No. 2-24 Duplex Automatic Milling Machine. Equipment includes an Index Base Attachment, for simultaneous milling and loading.

MACHINES

NATI

Your requirements for a variety of production milling operations have dictated the design of these new CINCINNATI Milling Machines. They combine advanced production features with easier, quicker, more convenient means of setting up the job. They are built in three styles: Plain, Duplex, and Plain Rise and Fall. All have . . .

Automatic Two-Way Table Feed Cycles for one-way milling; and for reciprocal milling with midway safety stop position. Complete operating cycle controlled through . . .

Cycle Selectors, a small cam shaft unit which can be removed and replaced in less than a minute. Units have been designed for almost every conceivable automatic cycle. In addition to table and spindle carrier cycles, cycle selectors initiate other automatic functions including . . .

Automatic Backlash Eliminator—It automatically engages during feed stroke; automatically releases during rapid traverse. Another cycle controlled feature of value in modern metalworking practice is . . .

Automatic Spindle Stop—When the table stops for loading and unloading the fixture, the spindle stops rotating. To the production advantages gained through these automatic features, add . . .

Single Control Lever—It starts the complete automatic cycle. And with the same lever you have . . .

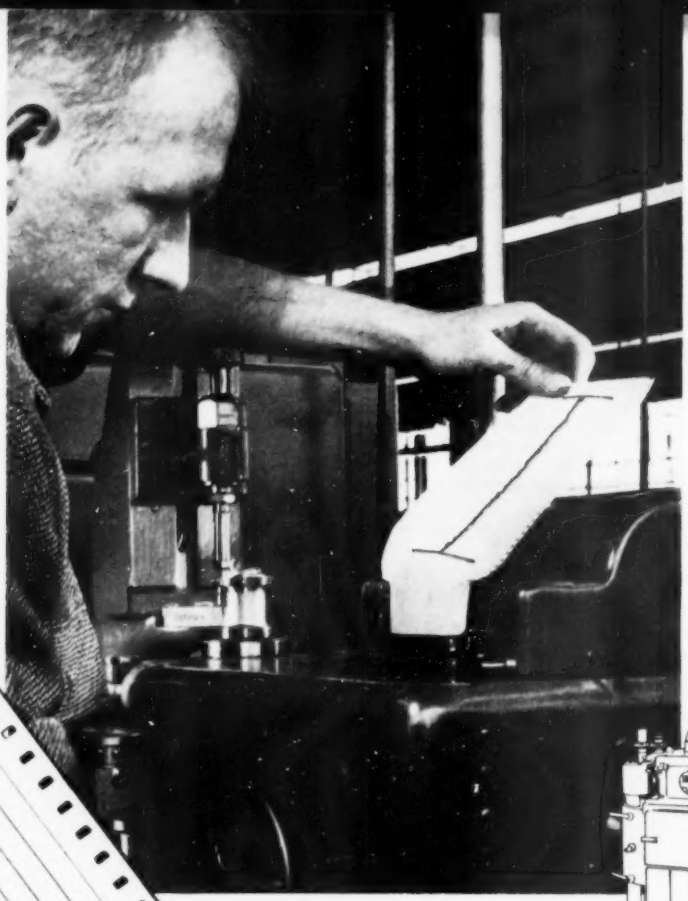
Power Manual Control of table; a labor-aiding convenience for setting up the machine. To top it off . . .

Dynapoise Overarm, a built-in feature that chokes self-excited chatter, smoothing out the cutting action.

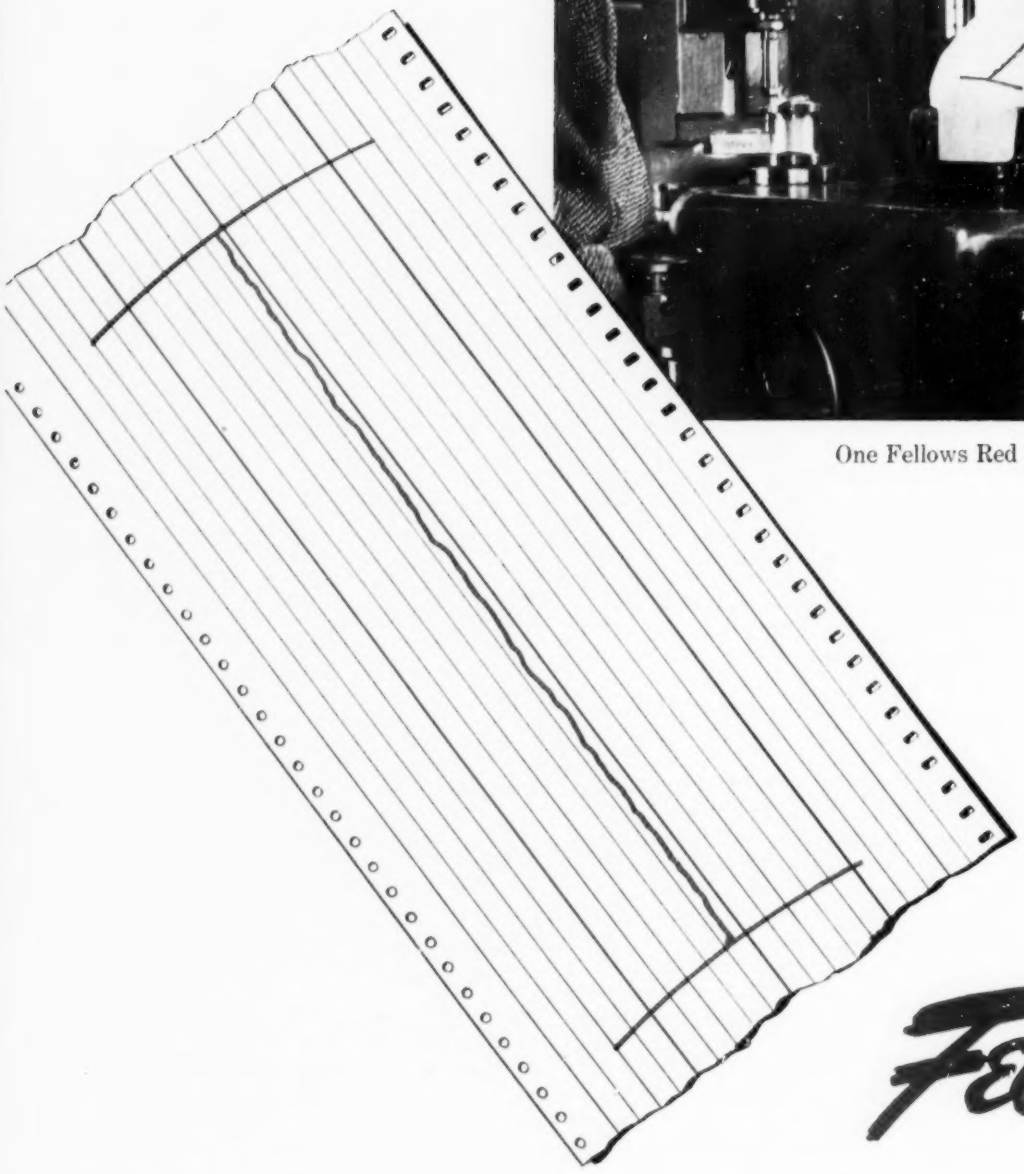
With new CINCINNATI No. 2-24 Automatics, metalworking shops everywhere can reduce the cost of milling operations, within 3 hp and 5 hp range, on a wide variety of parts manufactured in medium to infinite quantities. For brief data, look in Sweet's Machine Tool Catalog, or if you want complete information, write for new 28-page catalog, No. M-1760.

THE CINCINNATI MILLING MACHINE CO. CINCINNATI 9, OHIO

The FELLOWS METHOD
...in action!



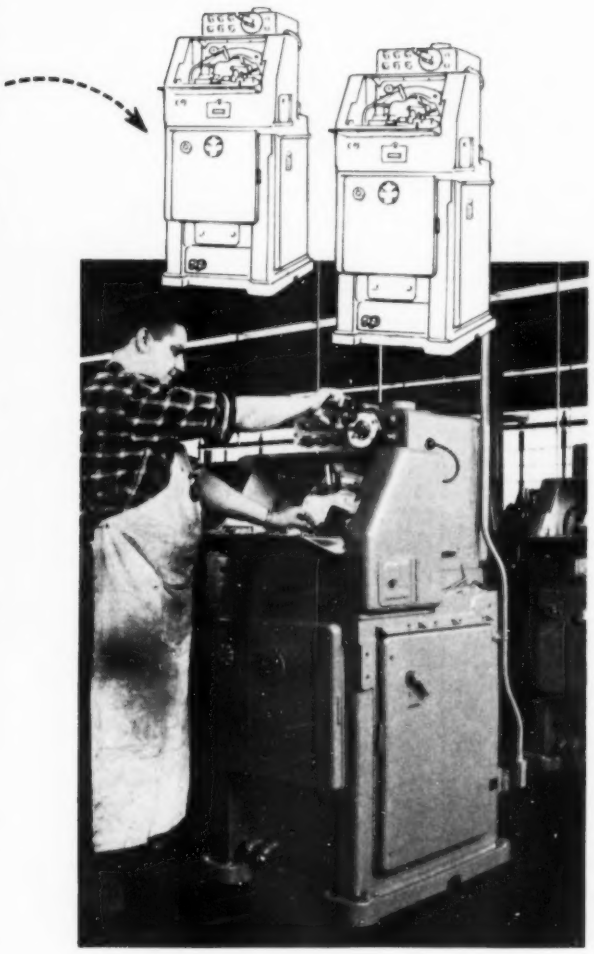
One Fellows Red Liner...



Fellows

A Sure Combination to

Mass Produce Gear ACCURACY



. . . to each pair of Fellows Shavers

Using one Red Liner with each pair of Fellows Gear Shavers has proved both practical and economical for the Arma Corporation.

Here's why . . . Arma makes basic weapon and missile control systems as well as navigational systems and remote precision control devices for the military and for industry and commerce. Hence the need for exceptional gear accuracy and for safeguards against excessive pitch line runout.

Fellows Shavers *create* that accuracy, and Fellows Red Liners *guard* it (by providing a permanent charted record of the "composite check" of each gear for quality control).

With this fast working and easy to operate Fellows combination, Arma increases production and makes wiser use of manpower.

This is a typical example of the Fellows Method in action. Why not call in a Fellows Representative and hear the details. They are interesting from *many* viewpoints.

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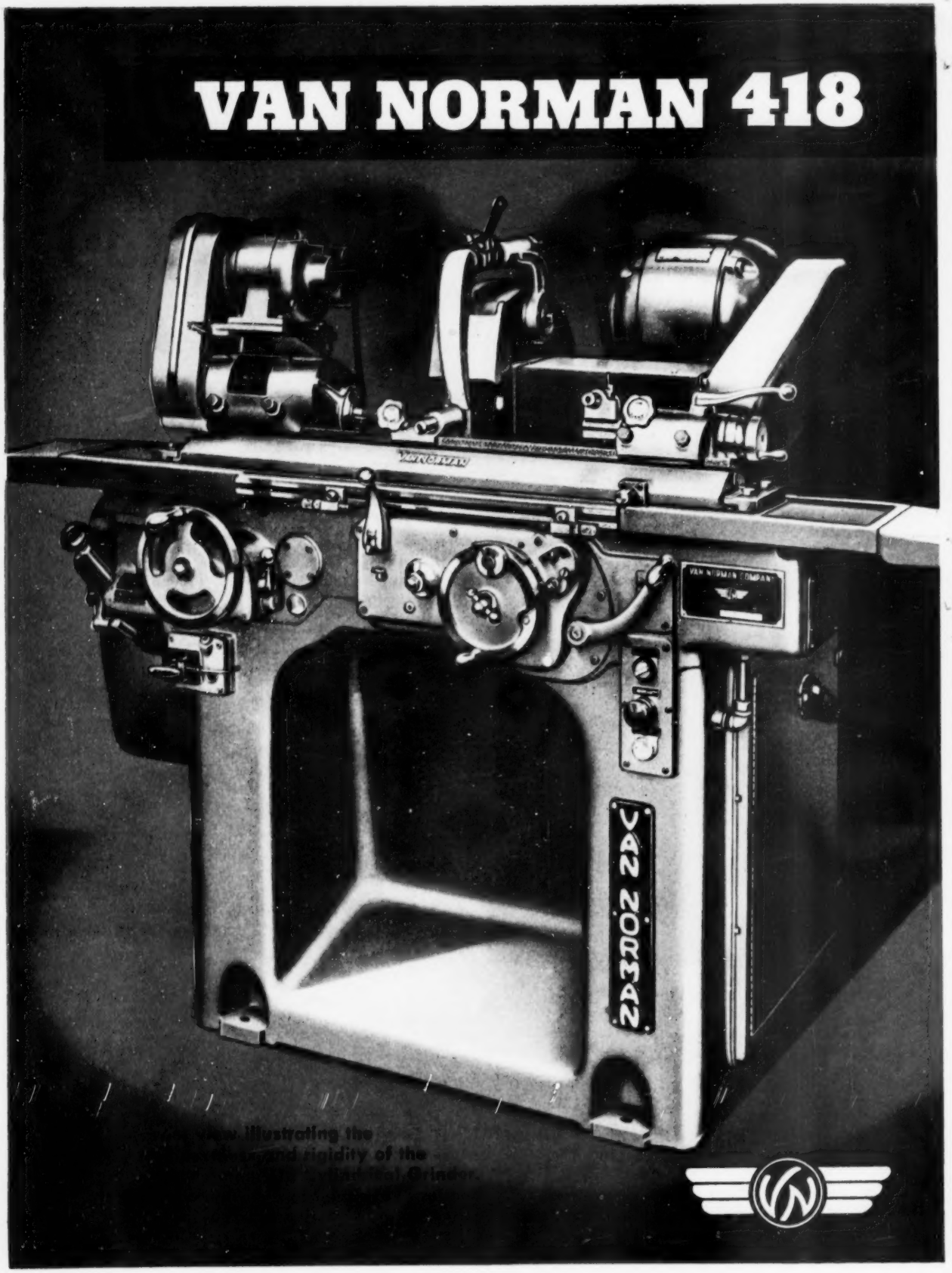
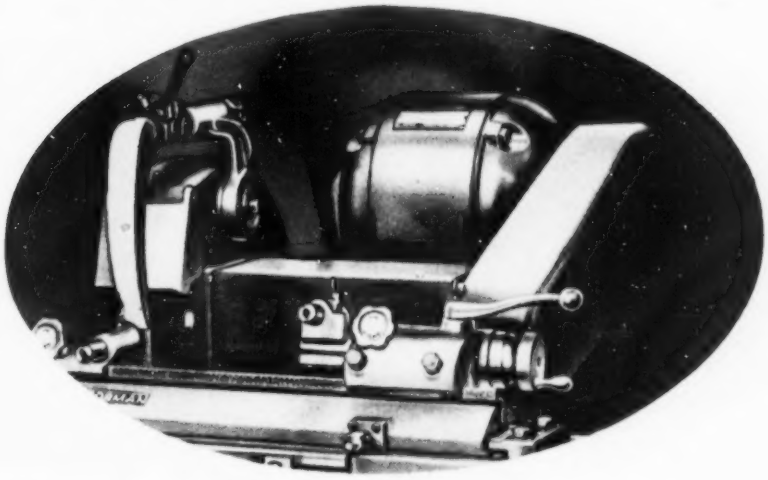

VAN NORMAN 418

CYLINDRICAL GRINDER

Engineered for Fast, Economical "Close-Tolerance" Plunge or Traverse Grinding of Small Parts



Grinding unit designed for maximum accuracy and long life. Pope wheel spindle equipped with heavy-duty, extra-large SKF double-row cylindrical roller bearings, assures smooth chatter-free finish.

The Van Norman 418 Cylindrical Grinder is completely engineered from base to bearings to give heavy machine performance. It is particularly adaptable for economical grinding in toolrooms, job shops or plants where work is usually in small or medium runs. Controls are conveniently grouped for ease of operation.

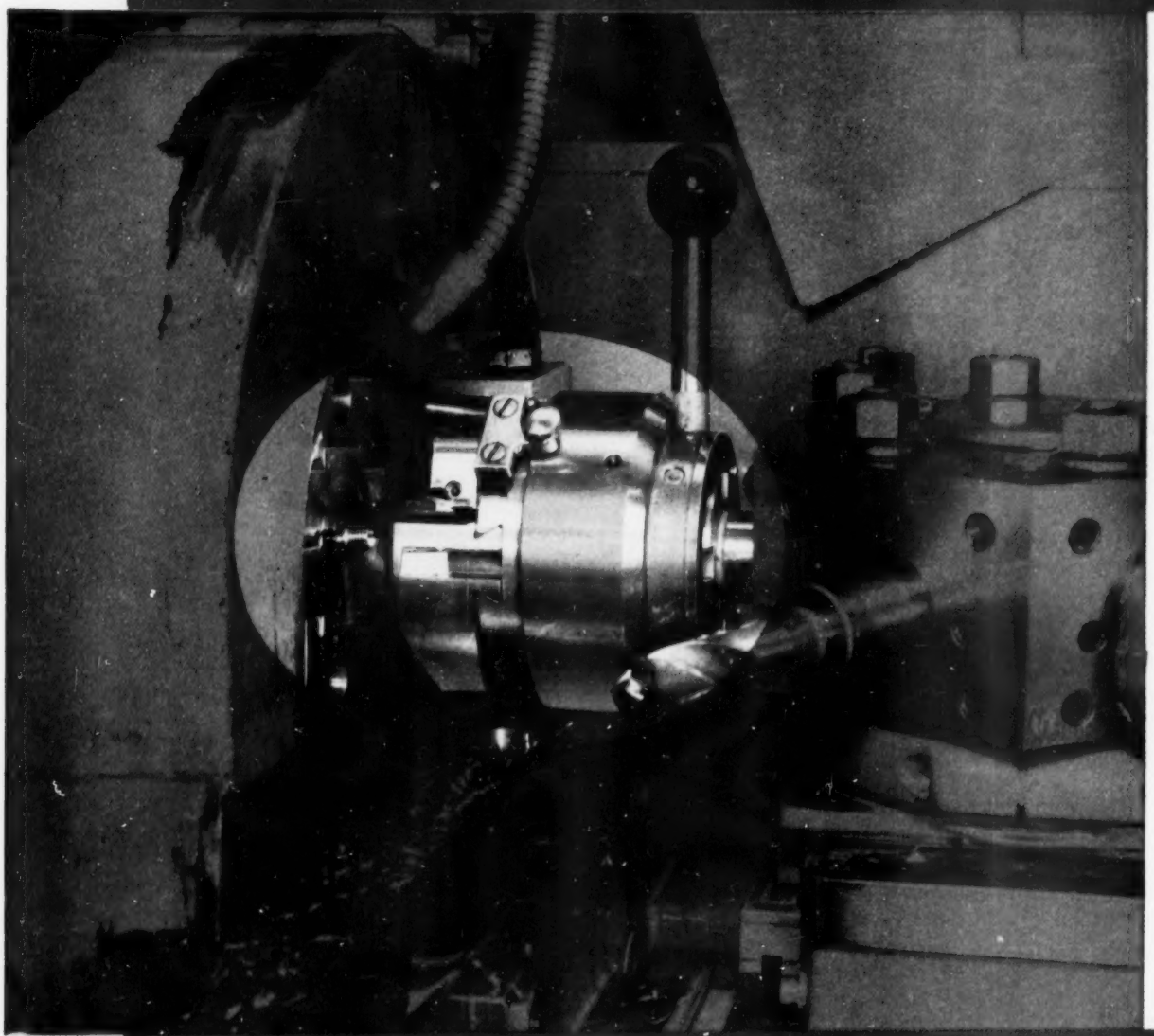
Write for bulletin giving complete details. Especially inquire about the price. It's exceptionally low for a quality grinder.

OTHER VAN NORMAN FEATURES

- Heavy-duty headstock and footstock for rigidity, accuracy and smooth grinding
- Single lever control for rapid traverse and plunge grinding
- Automatic starting and stopping of headstock and table traverse
- Rugged base, wide table bearing ways, separate motor drives for wheel spindle, table and headstock
- Floor space needed, only 43½" x 79¼"

VAN NORMAN COMPANY, SPRINGFIELD 7, MASS.

1800 Stainless Steel



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LANDIS *Machine* COMPANY

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THE WORLD'S LARGEST EXCLUSIVE MANUFACTURERS OF THREAD GENERATING EQUIPMENT

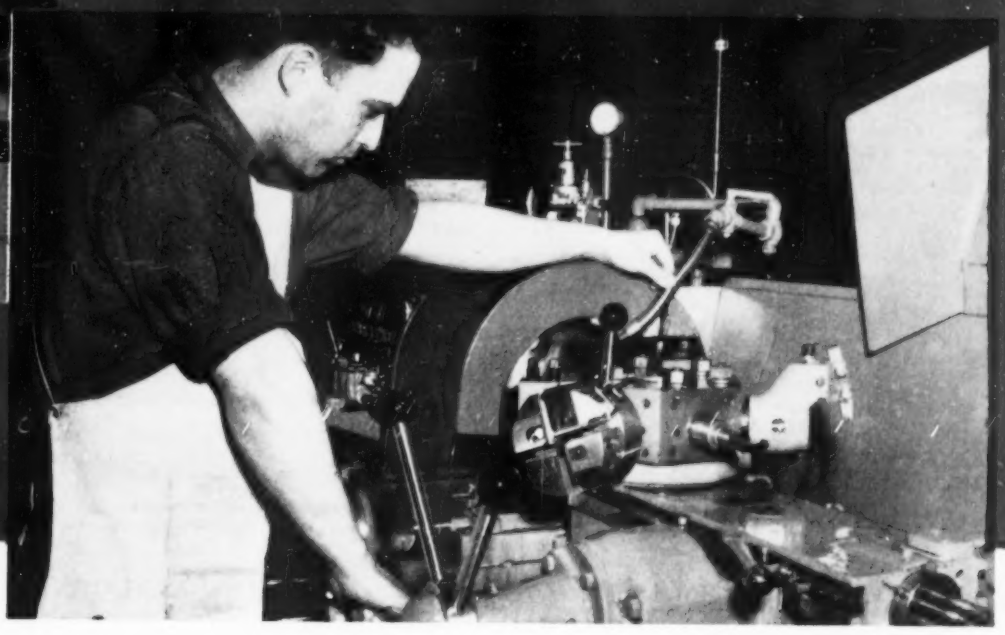
Threads Per Chaser Grind

LANDMATIC HEADS are every day saving production dollars for the Crawford Fittings Company of Cleveland by low tool cost and minimum machine downtime.

This company manufactures Swagelok Tube Fittings ranging from ¼" to 1" in diameter. These fittings are produced from stainless steel rods of austenitic type 316 cold-worked to a Brinell hardness of 250. In producing the 7/16" fitting, for example, (as illustrated) 20-pitch straight UN threads are cut close to the shoulder 5/16" long to Class 3 fit.

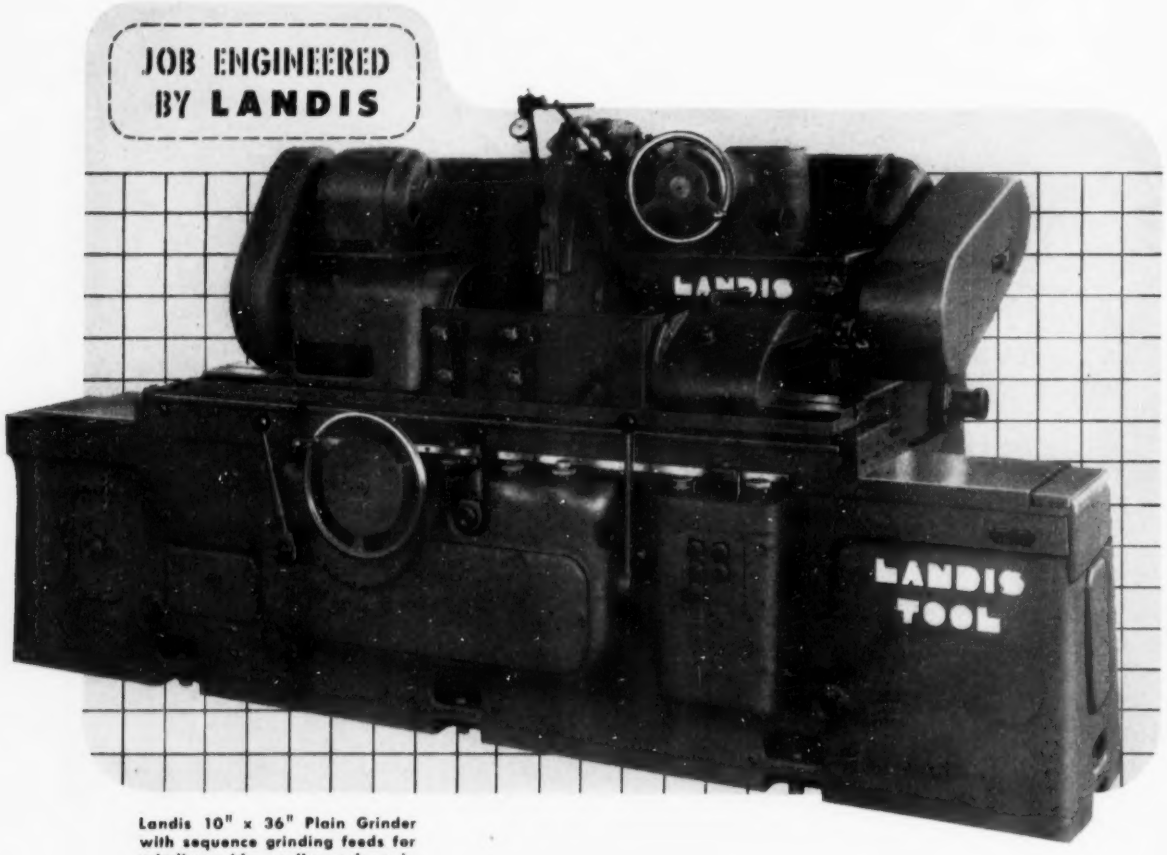
LANDMATIC Hardened and Ground Heads, such as used by Crawford, are designed to produce threads to Class 3 or 4 fit in all types of tough materials. Unusually heavy construction and sound fundamental die head design assure the rigidity necessary for accurate threads. The inherent features of the design of the Landis Tangential Chasers and the proper manufacture and hardening, developed during 50 years of threading experience, ensure long chaser life and low threading cost.

If you require threads on stainless steel or other tough material, LANDMATIC Hardened and Ground Heads offer you these same cost-saving features. Please send specifications and write for Bulletin F-8U for additional information.



How LANDIS JOB ENGINEERING Cuts Grinding Costs . . .

Added Tooling on Plain Grinders Gives BIG Cost Savings



Landis 10" x 36" Plain Grinder with sequence grinding feeds for grinding side walls and main bearings of crankshafts.

Job engineering by Landis starts with operator convenience, hydraulic controls and simplified maintenance of a standard Landis grinder. Then, on the basis of your requirements of finish, tolerance and production, additional tooling may be recommended to give you best results at the lowest possible cost. Automatic grinding cycles, angular wheelbase or spaced wheels are only a few of the many tooling arrangements that will give you big cost savings.

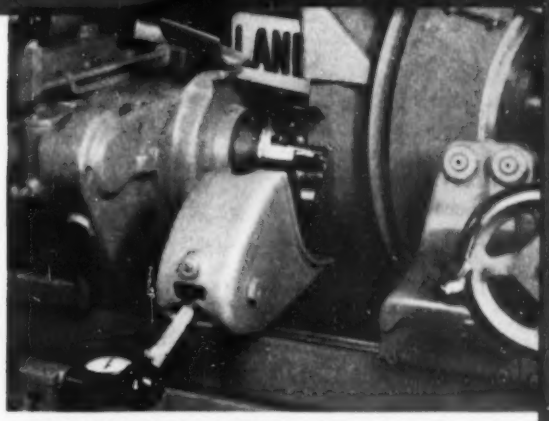
Send us your prints for tooling and production estimates. No obligation.

140

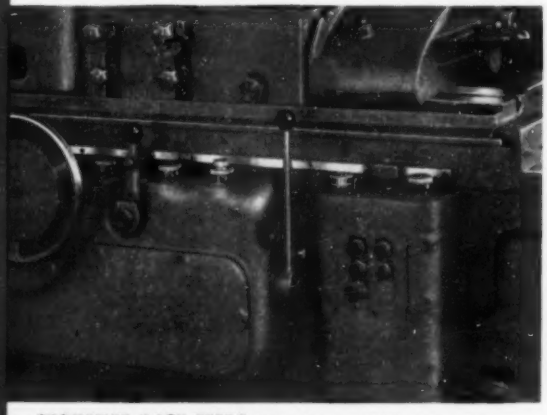
LANDIS
precision grinders

JOB ENGINEERED
BY **LANDIS**

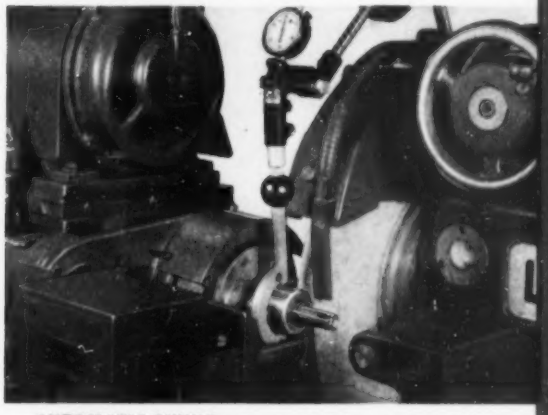
SHOULDER GRINDING for short runs of pieces which require accurate grinding of shoulders in combination with the O.D. grinding operation.



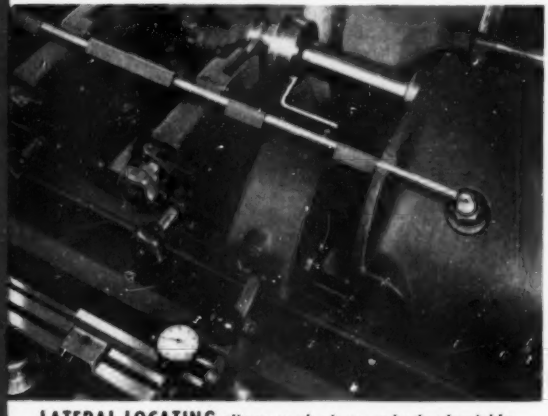
LIVE SPINDLE HEADSTOCK permits efficient O.D. grinding of diameters and faces of parts which are best suited to chucking. Straight or angle wheel heads can be used.



SEQUENCE RATE FEEDS for pieces which have combined sidewall and O.D. grinding. Gives separately adjustable rates of grinding feed.



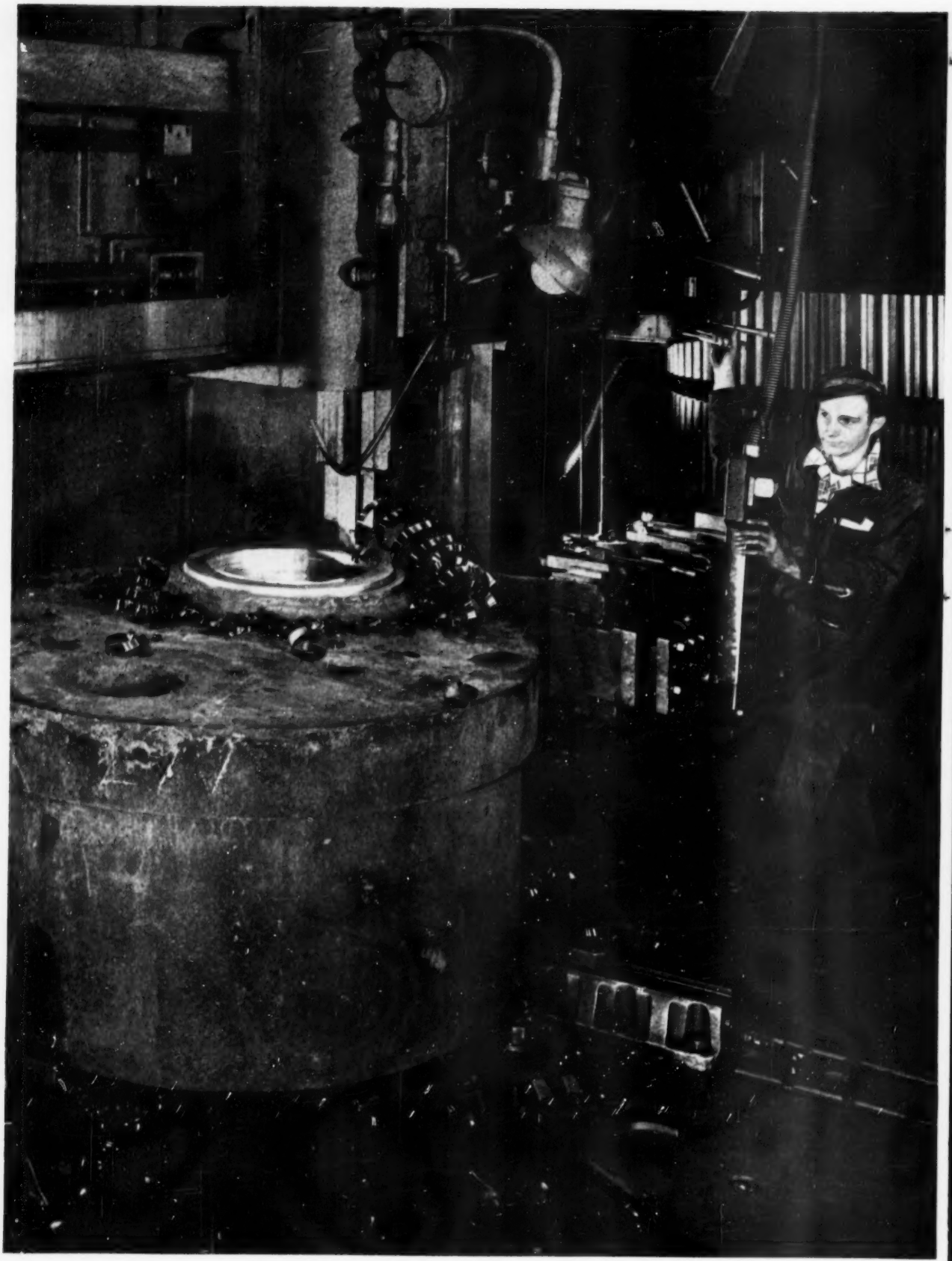
AUTOMATIC SIZING reduces need for operator skill by stopping grinding feed when finished size is reached. Used on infeed operations.



LATERAL LOCATING aligns work piece and wheel quickly and accurately. Eliminates possibility of work and wheel interference during rapid approach of wheel head.

PROFILE DRESSERS in a wide variety of types. Designed for precision dressing of shapes and radii on grinding wheels. Can save you time and eliminate extra operations.

LANDIS TOOL COMPANY • WAYNESBORO, PENNSYLVANIA, U. S. A.



Secret weapon...

yours or your competitor's?

Here's the G&L 8-ft. Heavy Vertical Boring Mill that gives you the advantages of speed, precision, extreme ease of control PLUS the capacity to economically perform a wide range of machining operations.

If your shop's efficiency and profit hinge on ability to perform many precision machining operations with one machine — check the G&L 8-ft. Heavy Vertical Boring Mill.

Its up-to-the-minute design incorporates all the latest features that speed up boring, turning, chamfering, facing, counterboring, grooving, recessing and numerous other operations. A new pendant control with a remote shift for single shift machines, increases operator efficiency and provides minimum expended effort on table speed changing. Feeds (16 in number from .004 to .750 in. per revolution) are conveniently available at all operating positions. Extra-heavy construction for best rigidity allows this size machine to be powered with drives up to and including 100 h.p. With a table diameter of 96 in. and heights under the rail available up to 101 in., large as well as small workpieces can be handled with the greatest degree of efficiency.

Two types of mechanical gear change drives and two types of single remote shift drives are available. Motors supplying power can be AC or DC for any recognized voltage or frequency. Tracer controlled machines are also available for special applications.

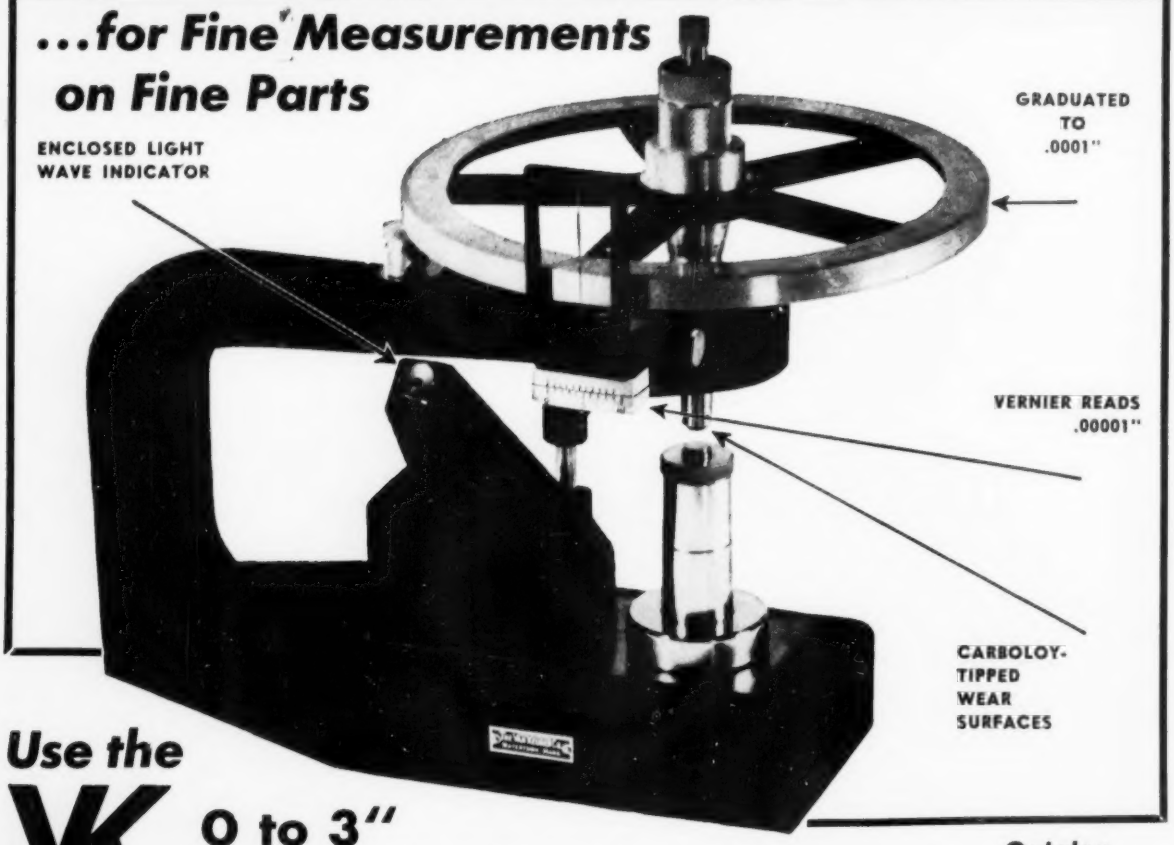
For complete information (on machines with 42-in. thru 12-ft. diameter tables), see your G&L representative or write —

GIDDINGS & LEWIS MACHINE TOOL CO.
FOND DU LAC, WISCONSIN

Builders of the world's finest heavy-duty Horizontal Boring, Drilling and Milling Machines — table, floor and planer types; Hypro Double Housing and Open Side Planers, Planer Type Milling Machines and Vertical Boring Mills; and Davis Cutting Tools.

Photo courtesy of Clearing Machine Corp.

...for Fine Measurements on Fine Parts



Use the VK 0 to 3" LIGHT WAVE MICROMETER

The Van Keuren Light Wave Micrometer is an instrument of exceptional accuracy, ideal for measuring plug gages or small precision parts. Use it when you're after "that last hundred thousandth" involved in so many of today's measurements. The 0 to 3" instrument shown above has a ½" diameter, 40 threads per inch micrometer screw, which can be made with greater accuracy, and which has 3 times the wearing surface of an ordinary micrometer screw. It has an 8" diameter micrometer wheel, with .0001" graduations 1/10" apart. It has a non-parallax vernier index which enables readings to be made to .00001". It has an index lock and carboloy-tipped anvil and spindle. This sturdy, sensitive instrument weighs only 17 pounds, and is in reality a portable measuring machine of inbuilt and sustained accuracy.

The Light Wave Micrometer is not a comparator. No gage blocks are needed and no errors creep in from worn blocks. It is a direct source of dependable precision . . . fast, accurate and profitable.

Catalog and Handbook No. 35

This 220-page volume represents years of research by the Van Keuren Co. It presents a simple and exact method of measuring screws and worms with wires, tells how to measure gears, splines and involute serrations. It is an accepted reference book for measuring problems and methods. Ask for your copy . . . sent free on request by writing: The Van Keuren Company, 173 Waltham St., Watertown, Mass.

VK

34th YEAR

THE Van Keuren CO.,

173 WALTHAM STREET, WATERTOWN, MASS.

Light Wave Equipment • Light Wave Micrometers • Gage Blocks • Taper Insert Plug Gages • Wire Type Plug Gages • Measuring Wires • Thread Measuring Wires • Gear Measuring System • Shop Triangles • Carboloy Cemented Carbide Plug Gages • Carboloy Cemented Carbide Measuring Wires

LINK-BELT Silent Chain Drives
assure 3 big bonus benefits

WHEN you buy a drive, you expect it to operate efficiently throughout its entire life. And with Link-Belt Silent Chain, you're assured of better than 98% *sustained* efficiency throughout its many years of service! What's more, these positive, no-slip drives are low in first cost . . . low in operating costs. And, with their ability to operate at higher speeds, you can reduce your investment in motors and controls. Link-Belt Silverstreak Silent Chain Drives are available from fractional to thousands of hp. You can obtain ½ to 50 hp drives (ratios of 1:1 to 7:1) from stock. Get complete information from your Link-Belt sales office or distributor.

LINK-BELT

SILVERSTREAK SILENT CHAIN DRIVES

13.240

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle, Toronto, Springs (South Africa), Sydney (Australia). Sales Offices, Factory Branch Stores and Distributors in Principal Cities.

Do many *different* grinding jobs . . . *all* with the

"TOUCH OF GOLD"

Norton's 10″ x 20″ Universal grinding machine famous for its versatility, quick set-up and smooth performance. Adds value to your product . . . increases your profit margin

Do you want the "Touch of Gold" on many grinding jobs? Want a multi-purpose machine for rough cuts or finest precision finishing?

Then you want Norton's 10″ x 20″ Universal . . . the grinding machine that gives you the "Touch of Gold," adds value to your product every time the grinding wheel turns. It helps you produce more work at less cost.

The Norton Universal 10″ x 20″ is a multi-purpose grinding machine that can do external, internal, face and angular wheel-feed grinding.

Head and footstock are interchangeable, permitting simplified set-up on jobs involving shoulders or spacers, especially on angular grinds. Set-ups are made easier on chucking jobs by the D1-3″ camlock nose on one end of the headstock spindle, and the provision for permanent chuck mounting. The headstock is easily swivelled 180° to change from dead center to chucking work.

The wide versatility of this machine proves once more that you economize when you modernize with a new Norton machine. You get the "Touch of Gold". For complete information see your Norton representative or write for Catalog 170-3. NORTON COMPANY, Machine Division, Worcester 6, Mass.

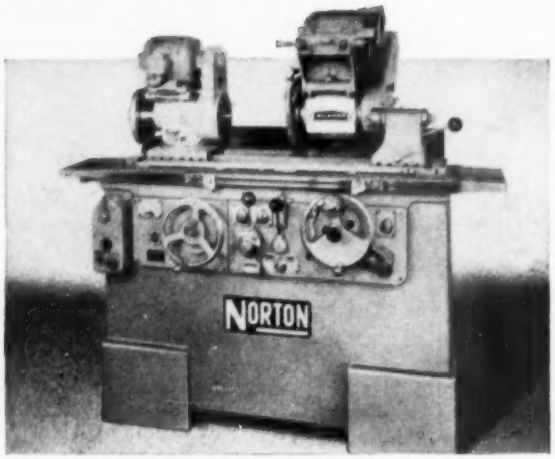
To Economize, Modernize With **NEW**

NORTON

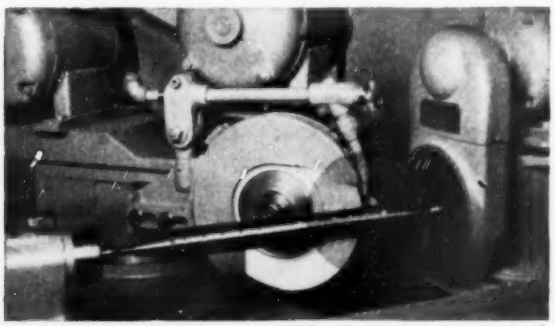
GRINDERS *and* LAPPERS

Making better products to make other products better

District Sales Offices: Hartford • New York • Cleveland • Chicago • Detroit
In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5

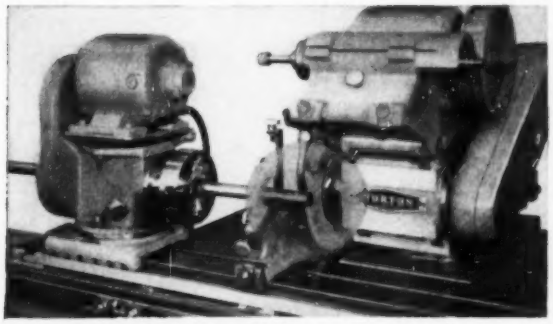


NORTON 10″ x 20″ Universal Grinding Machine. Wheel head swivels 360°. Internal spindle hinged to front of slide and swings up out of way when grinding external work.

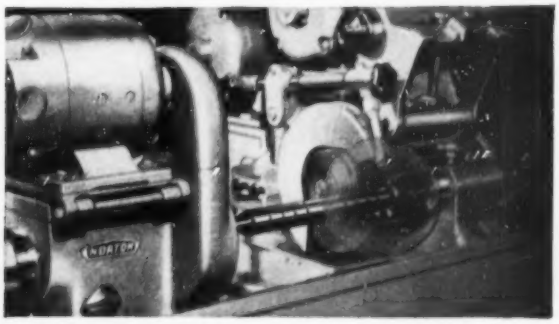


HEAD AND FOOTSTOCK are reversible. No need to change wheel and drive to the other end of spindle.

HE HAS THE "TOUCH OF GOLD" for external, internal, face and angular wheel-feed grinding — all on Norton's 10" x 20" Universal grinding machine.

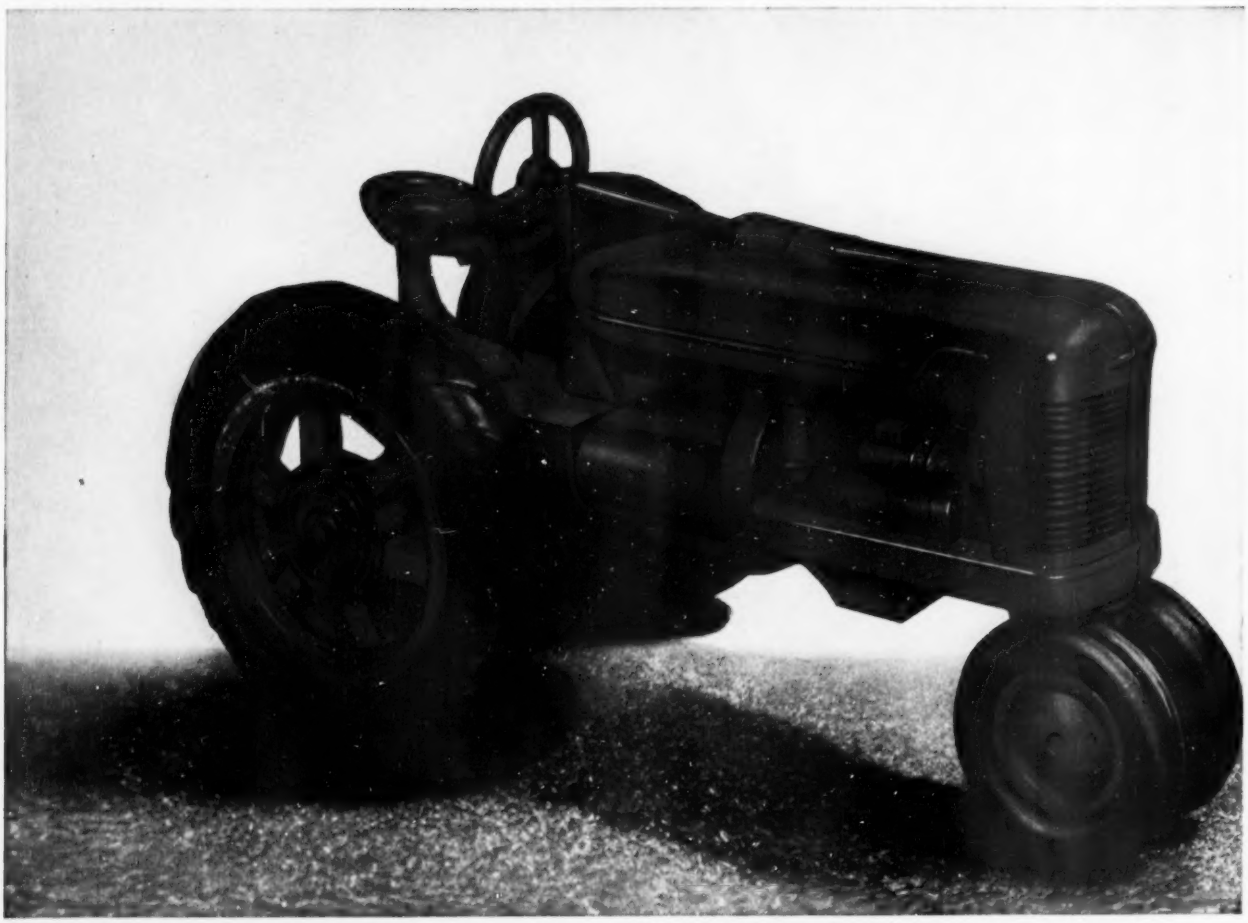


HOLLOW SPINDLE in headstock allows work up to 1" diameter and longer than machine to be passed clear through.

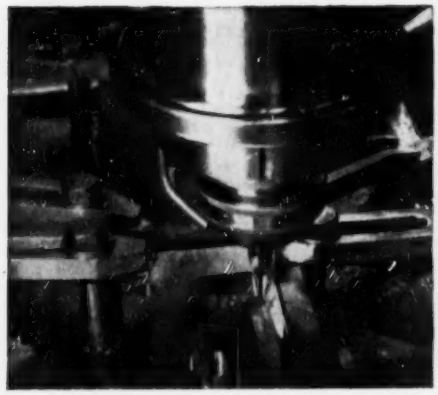


DEAD CENTER GRINDING — note chuck mounted at opposite end of head, a real set-up time saver.

STORY OF A TOOL,

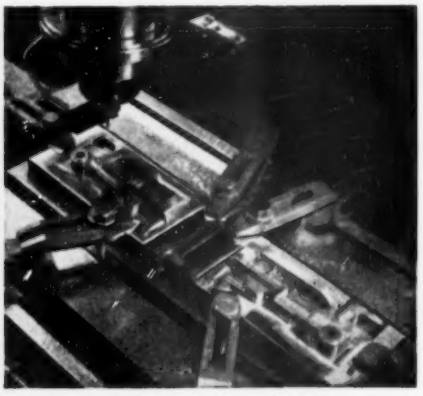


Look at that model! — so real you can almost hear the motor roar! Scale: 1/16″ to 1″. Accurate molds like the one that made this tractor are ideal jobs for Kearney & Trecker-Milwaukee Rotary Head Milling Machines.



Here's a close-up of one of the form cutters and one of the female halves of the mold. Note smooth finish.

Set-up for milling two halves of mold not changed until job is done. This insures faster and more accurate results.



Another set-up for milling mold halves. Note the gleaming final finish — very little or no hand finishing required.

A TOY AND A MOLD

Illustrated example of how the Rotary Head Method of Milling can solve highly complex milling problems . . .

SEE that scale model of a famous farm tractor — notice the fineness of detail!

Would you believe that one machine was capable of reproducing those details in the mold — that no models or templates were used — that all the machine operator needed was a set of blueprints?

Yes, that is exactly the case. The Kearney & Trecker-Milwaukee Model 2D Rotary Head Milling Machine has this amazing versatility.

It can reproduce geometric shapes in both horizontal and vertical planes! All the operator has to do is be able to read a blueprint and work simple mathematics!

On the job, the operator worked from scale reductions of real tractor assembly prints—only the most minute details eliminated. Workpiece material was oil-hardening tool steel. Results? The Rotary Head Milling Machine was Fast, Direct, Accurate.

Fast, because there was no delay in getting the job underway — no extra operations.

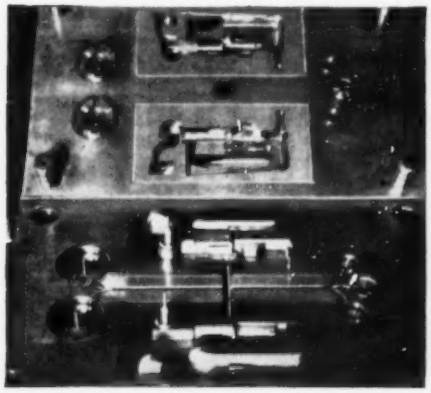
Direct, because the blueprint dimensions were transmitted immediately into metal.

Accurate, because the precise control of all cutting operations is built right into the machine.

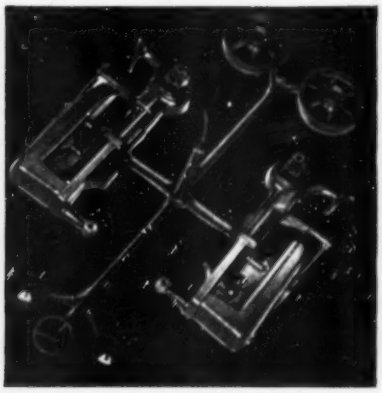
If you have an unusual production problem—it will pay you to investigate the Model 2D Rotary Head Milling Machine — For complete data write for Bulletin D20 — Kearney & Trecker Corporation, Milwaukee 14, Wisconsin.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Photos and data courtesy of: Product Miniature Co., Inc., Milwaukee, Wisconsin



The completed mold. Note wheel mold parts. All contours for hubs, spokes milled on Rotary Head machine.



Here's one of the finished thermoplastic parts just as they come from the mold...ready to cut, trim and assemble.

Model 2D Rotary Head Milling Machine. Helps you machine production parts, dies, molds and other jobs by the Rotary Head Method.

HOW WARNER & SWASEY FOR THOR POWER TOOL

Take a look at some of the typical time and cost savings delivered by Warner & Swasey 5-Spindle Automatic Bar Machines at Thor Power Tool Co., Aurora, Illinois...

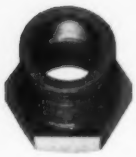
REDUCTION GEAR BLANKS

Savings pay for several new machines!

Large variety required—in lot sizes of 150-1500 pieces. Material: 8460 Steel.

Previous method:
2 single-spindle automatics, running continuously.

NOW
—One Warner & Swasey 5-Spindle Automatic does complete machining in equivalent of 4 days a week.



REDUCER BUSHING

Cuts Class 4 threads in same operation—costs reduced 8.5 to 1!

Previous method:
Threads milled, following rough forming on single-spindle automatic.

NOW
—Complete machining finished on Warner & Swasey 5-Spindle Automatic in one operation in 27 seconds!

DRIVE SHAFT IMPACT SPINDLES

Accuracy and rigidity deliver 4 to 1 savings!

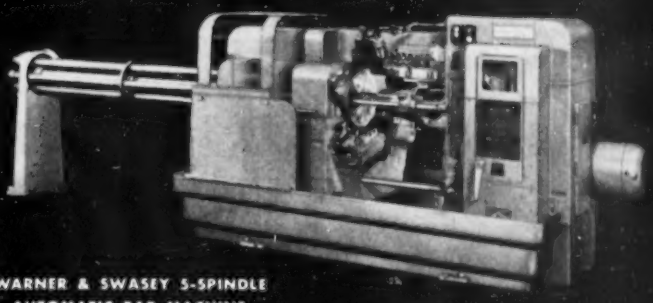
Material: Super tough rivet set alloy, especially made for Thor.

Previous method:
Roughed on single-spindle automatic, straddled to length on turret lathe—both machines running at half speed.

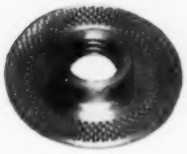
NOW
—finished for grinding in single operation on Warner & Swasey 5-Spindle Automatic running at full speed.

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS WITH WARNER & SWASEY

AUTOMATICS CUT COSTS COMPANY



WARNER & SWASEY 5-SPINDLE
AUTOMATIC BAR MACHINE



SANDING PAD NUT

One machine does work spread over 3 departments!

Problem: To thread part at perfect 90° angle to outside face, and hold concentricity.

Previous method:
Part machined in 3 different departments. Difficulty was experienced in holding piece in fixture for knurling.

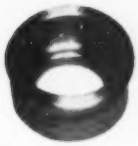
NOW
—Thread tapped into bar stock and balance of cuts made, including knurling, in one operation on Warner & Swasey 5-Spindle Automatic.

THIN WALLED PROTECTION NUT

Combines operations at high removal rate!

Previous method:
Three operations — rough turned, relief cut made in second operation, Class 3 threads hobbed in third. Cost of last step alone ran 20¢ per part.

NOW
—finished in one operation in 132 seconds on Warner & Swasey 5-Spindle Automatic.



LOCK COLLAR

Slashes machining time on longer runs!

Quantities: 20,000—30,000 pieces.

Previous method:
Run on conventional multi-spindle automatics in 75 seconds.

NOW
—on Warner & Swasey 5-Spindle Automatics parts made in 27 seconds!

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880

MACHINE TOOLS, TEXTILE MACHINERY, CONSTRUCTION MACHINERY

"If MORSE CUTTERS are good enough to make Morse Tools . . . then they're plenty good for us, too!"

That's right — Morse Milling Cutters are used every day in the Morse plant — to make all Morse Cutting Tools the finest precision made tools in the market.

Morse knows from years of closely checked experience, that these Cutters impart longer life, smoother cutting action, and higher return per sharpening than any other cutters. And when you "thrive on your own cooking," then that's proof that the cooking is tops!

Besides the cutters shown here, your Morse-Franchised Distributor can supply you with Angle, Concave or Convex Cutters, Woodruff Keyseat and Involute Gear Cutters, and others. He's your right-hand man for cutting costs — so see him today about the Morse Milling Cutters you need in *your* operation.

MORSE TWIST DRILL & MACHINE COMPANY
NEW BEDFORD, MASSACHUSETTS
(Division of VAN NORMAN CO.)
Warehouses in New York, Chicago, Detroit, Houston, San Francisco

MORSE
Cutting Tools

Buy them by phone from your Morse-Franchised Distributor and save ordering time

TOPS IN QUALITY..

The NEW "J&L COLD FINISHED

UNSURPASSED AMONG FREE-MACHINING STEELS

"J&L 1200" Steel, most recent of the corporation's many Cold Finished firsts has already proved itself in Screw Machine Shops throughout the industry. More and more evidence of the outstanding performance of this new free-machining steel is constantly being furnished by reports from the growing number of machine shops who regularly specify "J&L 1200" Cold Finished Steel for their production runs.

"J&L's 1200" series meets equivalent compositions published by the American Iron & Steel Institute, the Society of Automotive Engineers, and Federal Specifications QQS-663.

. . STANDARD IN PRICE

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CARBON STEEL

You'll find the information in this booklet useful.

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Please forward a copy of your booklet, "J&L 1200" Cold Finished Steel.

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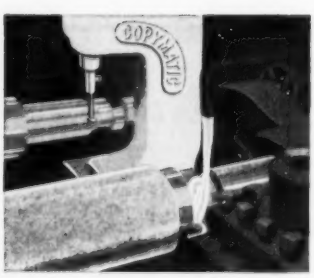
Try "1200" Steel On Your Tough Jobs...

Tops in Quality
Tops in Machinability
Tops in Uniformity
Tops in Finish

IT'S AVAILABLE IN ALL STANDARD SHAPES AND SIZES

J&L STEEL

HOW HIGH IS UP?



Perhaps it's "the point toward which manufacturing costs are constantly climbing." What methods may be used to keep costs and prices from vanishing out of sight and reason?

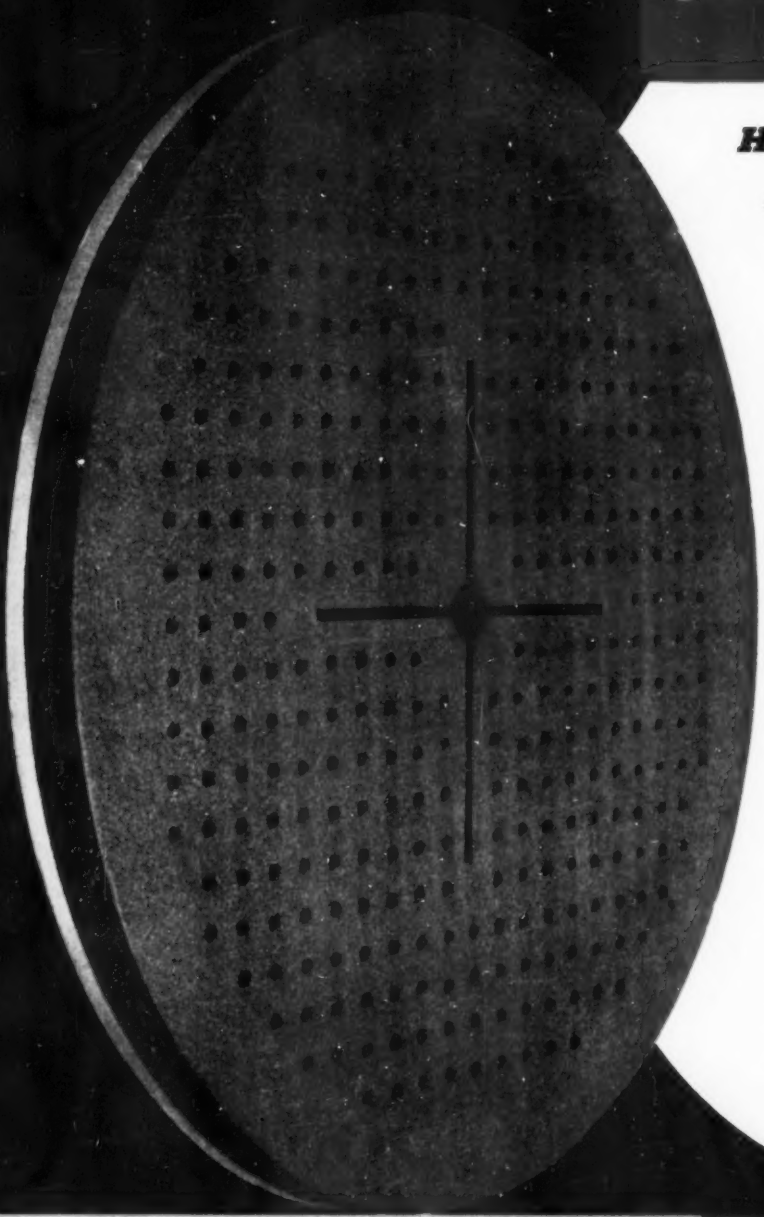
Since time and manpower are the vital elements in costs, many progressive manufacturers are using Lodge & Shipley COPY-MATIC Tracer Controlled Lathes to combat rising costs. Carefully verified reports show time savings as high as 87%, production increases up to 536%, savings of $14,000 in a year.

The COPYMATIC is so versatile even smaller shops find it a profitable producer . . . it offers instant changeover from tracer control to engine lathe. A COPYMATIC can save you money, too. Ask for case histories and Bulletin No. 675.

THE **Lodge & Shipley** COMPANY

3059 COLERAIN AVE., CINCINNATI 25, OHIO

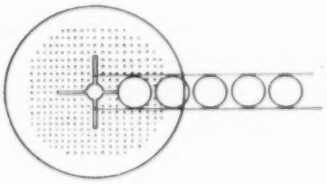
Gardner Abrasive Engineering



How a new type disc improved coolant distribution . . . made feed-thru grinding more efficient

THE PROBLEM

When grinding parts approximately 4" diameter on a double spindle grinder with feed-thru fixture, inaccurate work and some burning was experienced. Coolant introduced through hollow spindles did not properly reach grinding area.



THE SOLUTION

Four 1/4" wide radial slots extending out from center hole were introduced into abrasive to insure a free, uniform flow of coolant to work. Result: Stock removed without burning; required tolerances and production maintained.

Gardner Abrasive Engineering offers experience derived from making both the grinding machines and the abrasive discs. It considers machine performance first and then evaluates how grade and grain of abrasive affect grinding results. If standard abrasive discs won't do the job, discs are made *just for you.*

For help with your grinding problem, consult the Gardner Abrasive Engineer. 111A

GARDNER MACHINE COMPANY
410 Gardner St., Beloit, Wisconsin, U.S.A.

GARDNER

abrasive discs

Bring out the hidden profits in your rough grinding with the

"TOUCH OF GOLD"

Too often rough grinding is regarded as a necessary evil, a red ink entry on the production ledger.

The fact is that rough grinding jobs *can* be — and *should* be — as definite money-making operations as any other form of grinding.

And they *will* be when you add the "Touch of Gold" with Norton wheels that are exactly right—as to abrasive, bond and every other detail—for the work you're doing on the machines you're using.

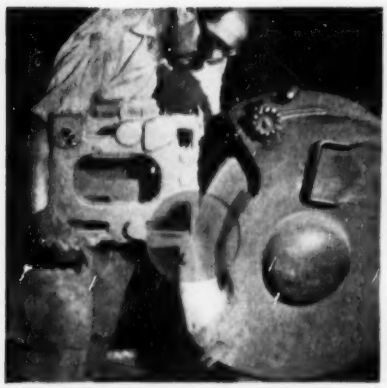
Then you'll grind off more metal per dollar, increase production and cut costs every day, on countless routine jobs.

And you'll realize that the *hidden profits* in your rough grinding operations need only this time-and-money-saving "Touch of Gold" to bring them to light.

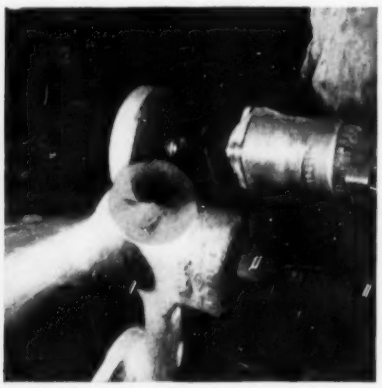
Your Norton Distributor

can bring long, practical experience to your rough grinding problems. If necessary, he'll call in your Norton Abrasive Engineer for expert advice on any new or difficult applications. Backed by the world's largest manufacturers of abrasives, with the broadest line to choose from, these Norton men will make sure you get exactly the wheels you need for best results.

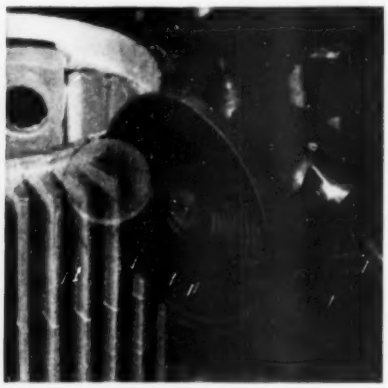
Ask your Norton Distributor for Booklet No. 1405 . . . 54 illustrated pages covering every phase of rough grinding. Or write direct to NORTON COMPANY, Worcester 6, Mass. Distributors in all principal cities — listed under "Grinding Wheels" in your telephone directory yellow pages. *Export:* Norton Behr-Manning Overseas Inc., Worcester 6, Mass.



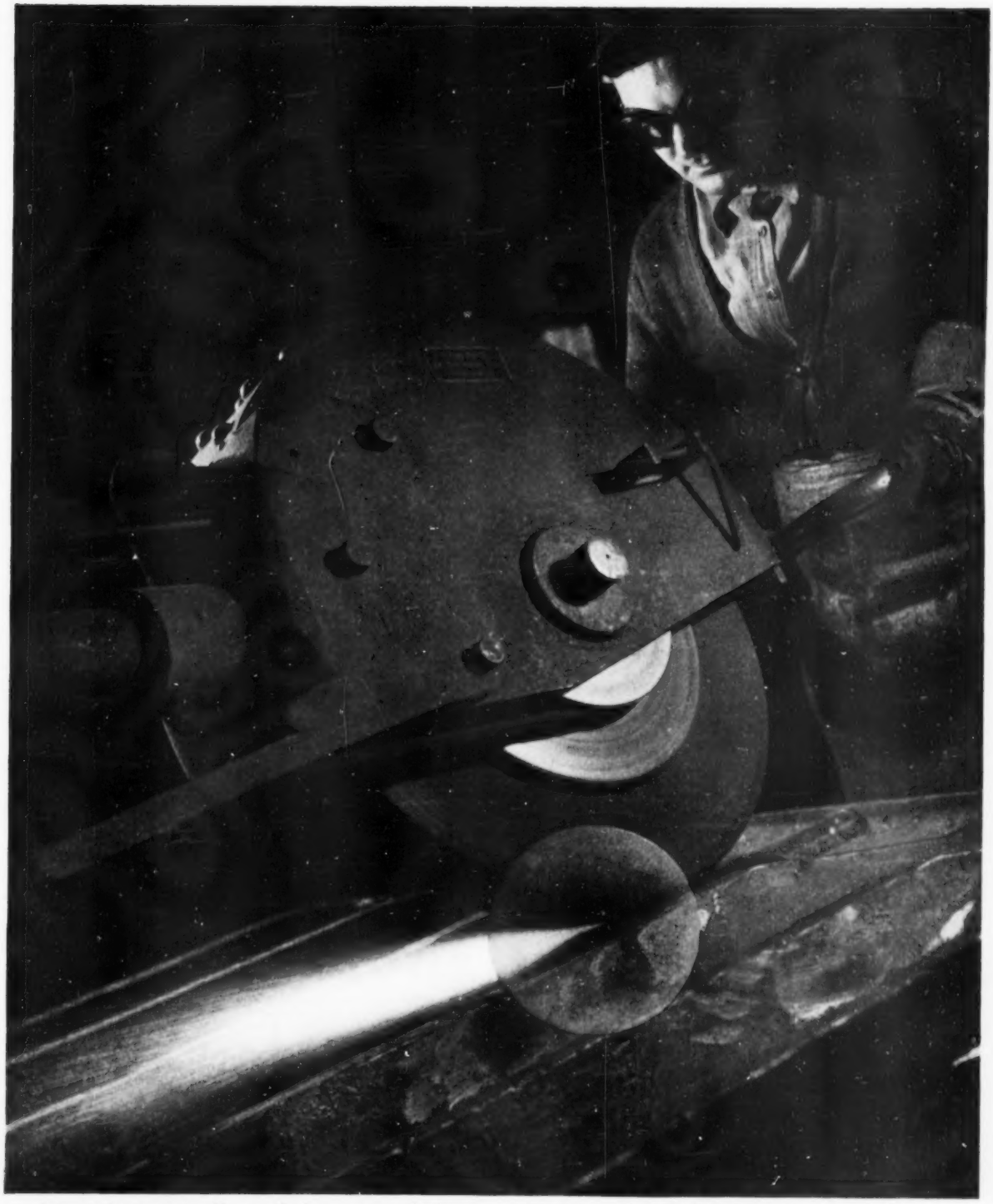
On floor stands you grind faster, at lower cost with Norton ALUNDUM or CRYSTOLON wheels. There's a right Norton abrasive-and-bond combination for every metal, every job.



On portable grinders the smaller Norton wheels do the same big job of cost cutting. With their inbuilt balance they *hug that work* — to grind more metal per man-hour.



On many jobs the versatile Norton Nylon-Reinforced Hub Wheels — BD rigid and BFR semi-flexible—are the fastest, easiest, *safest* wheels to use. They're ideal for weld grinding and similar finishing operations.



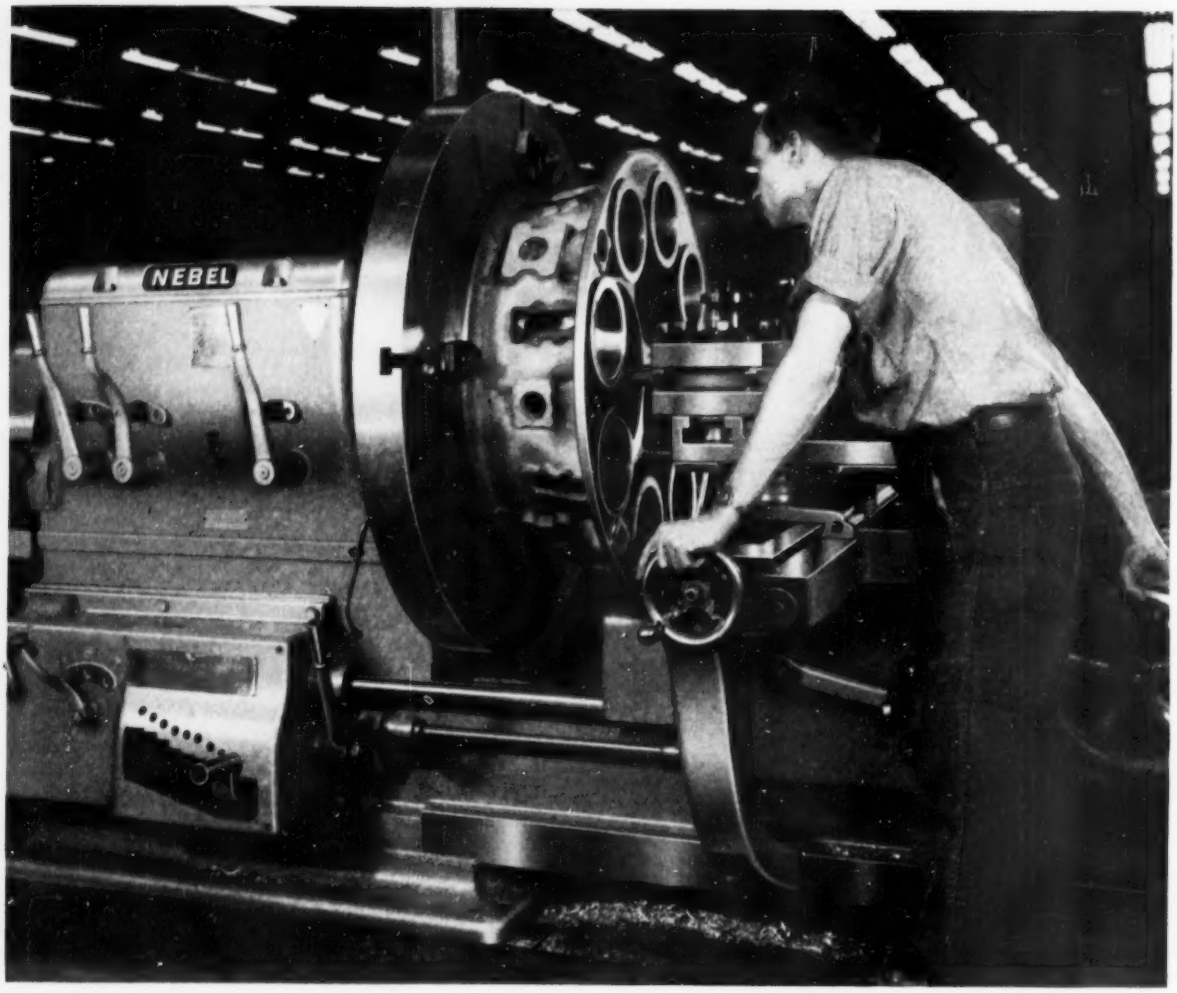
On swing frame grinders Norton wheels stand up under heavy grinding pressures at high speeds, combining fast, clean cutting action with extra long wheel life. For high tensile strength metals use ALUNDUM* abrasive; for low tensile metals, CRYSTOLON* abrasive.

NORTON
ABRASIVES

Making better products . . . to make other products better

W-1497

*Trade-Marks Reg. U.S. Pat. Off. and Foreign Countries



Speed and Accuracy count at G.E.'s jet engine plant

TOUGH JOBS ARE EASY WORK for Nebel extension bed gap lathes . . . with their flexible swing and center distance capacity. The Nebel "G" series shown above—machining a hard-to-handle compressor rear frame—is one of several on the job at General Electric's jet engine plant in Cincinnati.

MORE LATHE...LESS MONEY. Nebel lathes give you the speed, power, stamina and accuracy you need at minimum cost. They're ideal for production and maintenance requirements. Available in heavy duty engine, removable block gap and extension bed gap models . . . in swing sizes from 16" to 50".

basic... economical... dependable

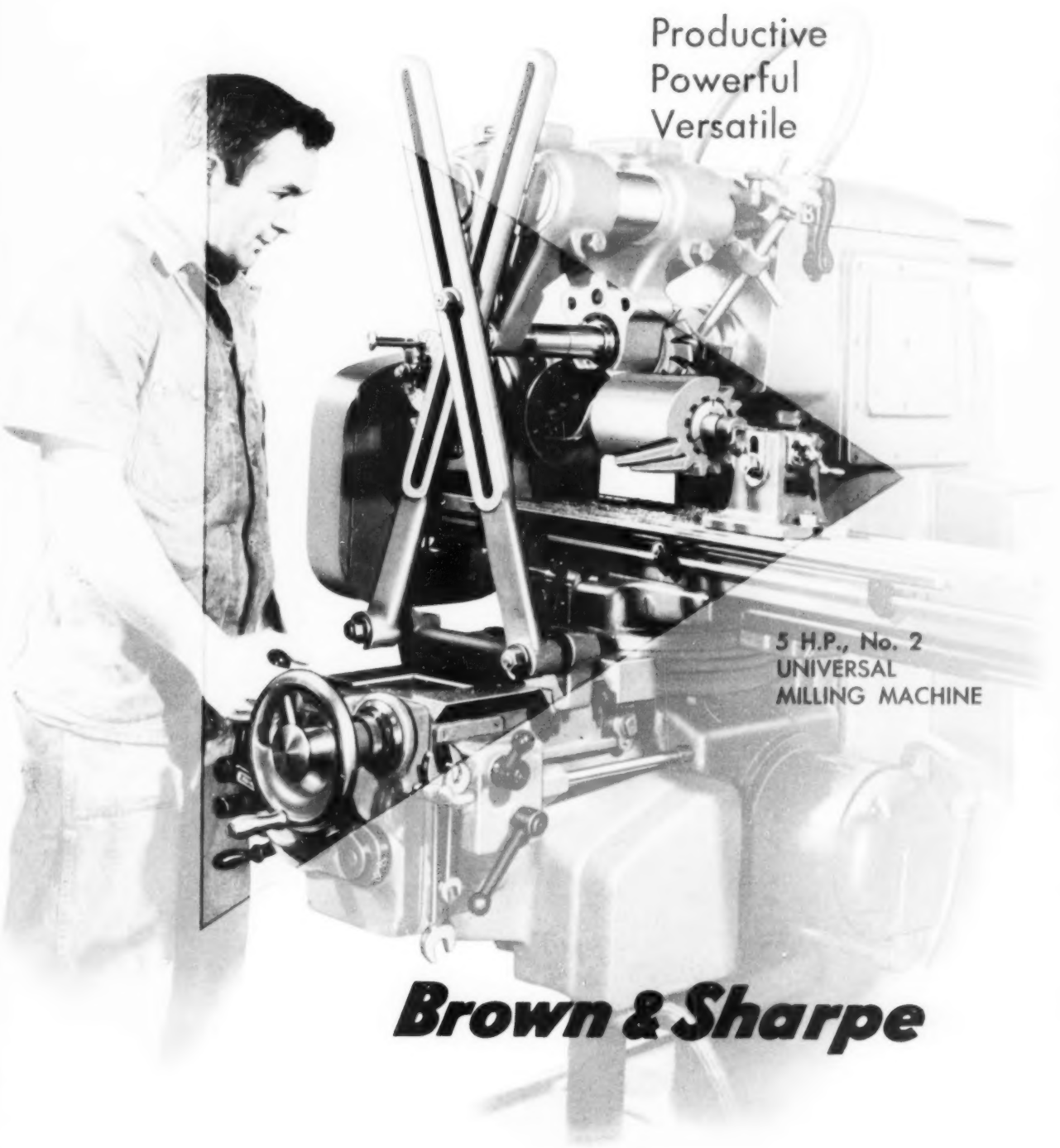
Write today for descriptive literature. The Nebel Machine Tool Co., Cincinnati 25, Ohio, U.S.A. Members of the National Machine Tool Builders' Association.

Nebel

the workhorse of the metalworking shop since 1899

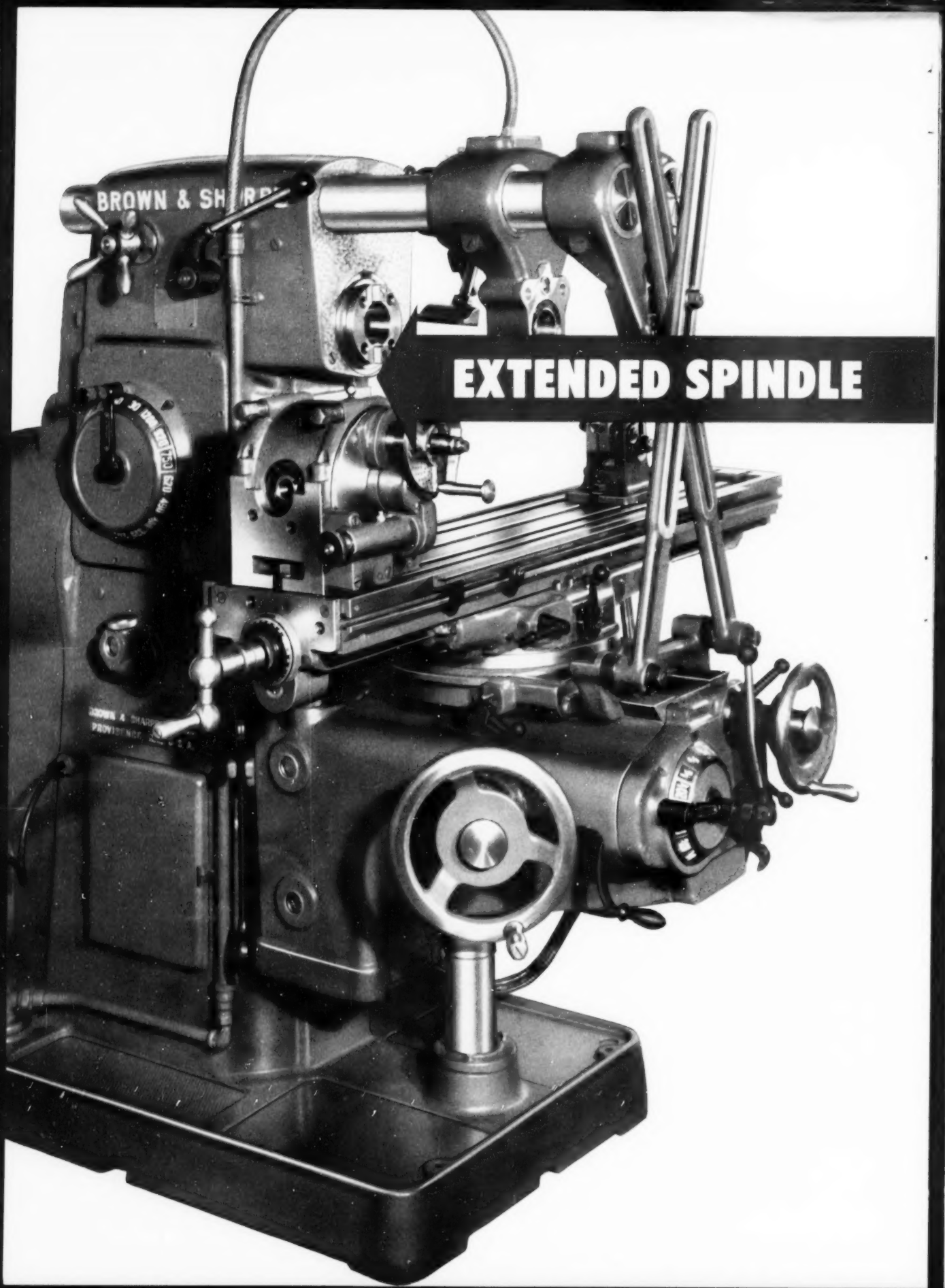
UNIQUELY BALANCED...

Productive
Powerful
Versatile



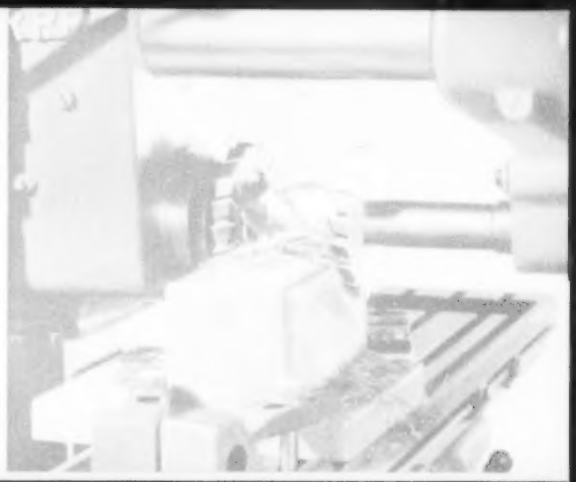
5 H.P., No. 2
UNIVERSAL
MILLING MACHINE

Brown & Sharpe


EXTENDED SPINDLE

. . . gives more rigid cutter support

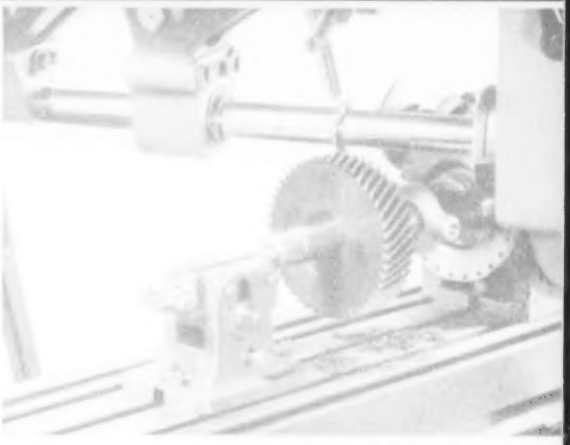
The 5 H.P. Brown & Sharpe No. 2 Universal Milling Machine is shown here set-up for a multiple milling cut. This is an excellent example of the exclusive Extended Spindle Face which permits using cutters close to spindle nose, affording the greatest possible rigidity. Heavy cuts at fast feeds are thus possible . . . often with smaller, less expensive arbors and cutters.



FACE permits heavier cuts...

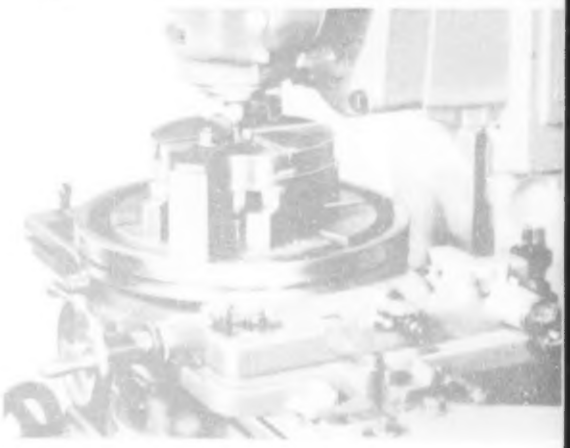
. . . reduces arbor deflection

This milling operation shows how Extended Spindle Face permits cutting closer to spindle nose with considerable swing of table . . . minimizing arbor deflection even on heavy cuts.



. . . provides added clearance for work and fixtures

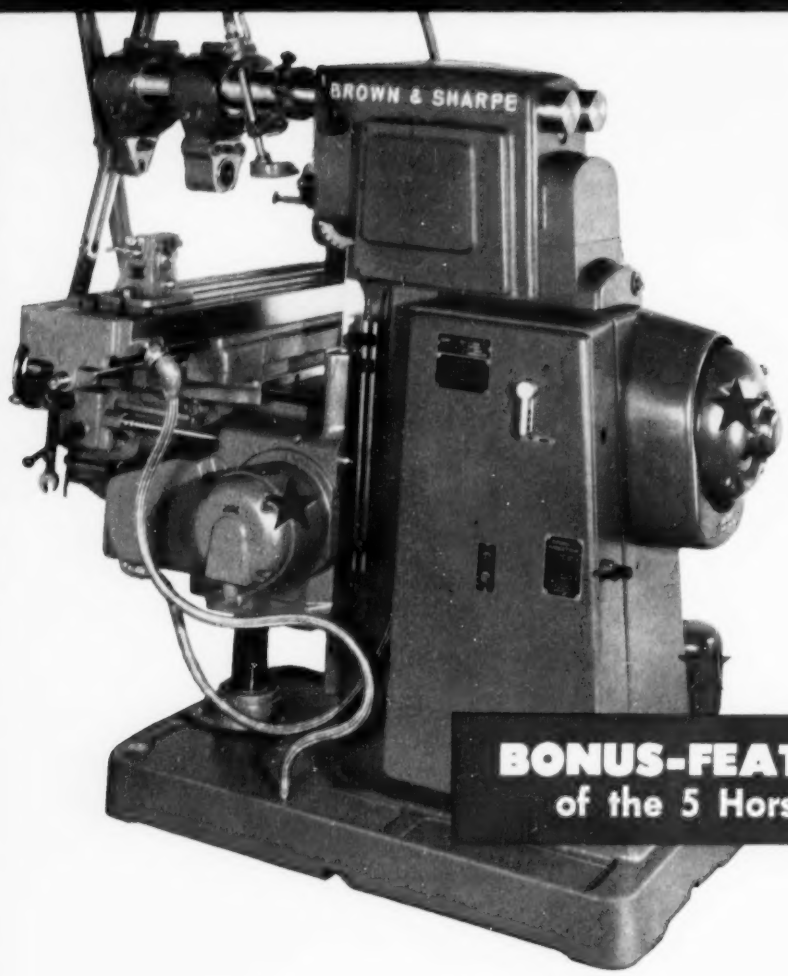
The 5 H.P. Universal is shown here with Vertical Milling and Rotary Attachments. Note that the Extended Spindle Face provides ample clearance for large or irregular work pieces or holding fixtures . . . gives maximum rigidity of attachments without loss of throat distance.



No. 2 Universal Milling Machine, 5 H.P.

In addition to the many advantages of its exclusive Extended Spindle Face, this 5 H.P. machine gives you a host of other important features that contribute to its greater productivity, power, and versatility. It's a machine you can't afford to overlook when "shopping" for this type equipment. Look over the additional design features of the 5 H.P. Universal on the following page.

Brown & Sharpe



Tri-Motor Drive for efficiency... no clutch needed

3 individual driving motors . . . full 5 H.P. for spindle, ¾ H.P. for table, and ¼ H.P. for coolant . . . advantageously placed. Saves power loss within machine, assuring full power for driving cutter. Feed motor coordinated with spindle motor. Thus entire machine is controlled by start-stop lever. All-gear drive.

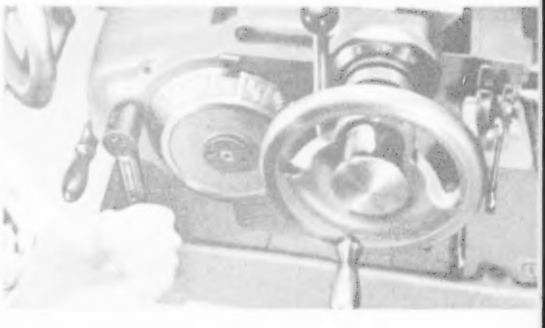
BONUS-FEATURES of the 5 Horsepower No. 2 Universal

Time-saving Controls Speed Production

Convenient fan-like arrangement of all operating controls promotes easy operation. Other control features include: directional feed control levers; longitudinal feed lever that cannot be engaged when table is clamped; fast travel in all directions with spindle rotating or stopped.

18 Feeds — 18 Speeds — quickly selected . . .

Wide choice of feed rates in range where majority of work is milled . . . 14 of the 18 under 10" per minute. Ease of selection prompts operator to change to most productive rate as conditions warrant. 18 changes of speed give suitable cutting speeds from small end mills to large face mills . . . on a wide variety of materials.



- Well proportioned for rigidity under capacity loads.
- Uniform feed and fast travel in all directions . . . gives same surface finish for longitudinal, transverse or vertical cuts, without changing feed rate.
- Automatic lubrication provided on all driving mechanisms.

Write for illustrated literature on the 5 Horsepower Universal, or any of the other Brown & Sharpe Products listed below.

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Milling Machines • Grinding Machines • Screw Machines • Cutters
Machine Tool Accessories • Machinists' Tools • Johansson Gage Blocks
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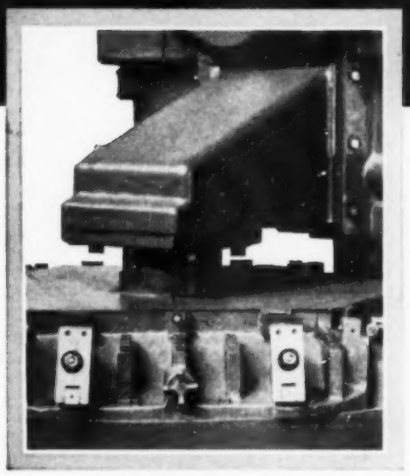
BROWN & SHARPE MFG. CO., PROVIDENCE 1, R. I., U. S. A.

PRINTED IN U.S.A.

NEWTON VERTICAL SPINDLE ROTARY CONTINUOUS MILLING MACHINES



CENTER SUPPORT
Furnished when required

DESIGNED FOR HEAVY MILLING WITH CARBIDE CUTTERS

This representative example of Newton high production milling machines has the advanced features required for heavy precision milling with carbide cutters and motors up to 50 H.P. An unusually rugged frame provides the rigidity necessary to such operation. On long work pieces such as automobile and tractor cylinder heads, 36" between spindles makes possible the completion of the roughing cut before the finishing cut starts. Independent pick-off gears for each spindle provide the means for correct cutting speeds for both roughing and finishing cuts. Heavy flywheels, solidly attached to each spindle, insure maximum cutter life between grinds. Intermittent feed—rapid traverse attachment and center support are optional. Two standard table sizes. Other table sizes and spindle center distances are available. Newton Milling Machines, applicable to your precision milling problems, will help to step up your production and reduce your costs. Complete information will be furnished upon request.

Among Heavy Machine Tools built by Consolidated are . . . .

LATHES
BORING MILLS
DRILL PRESSES
MILLING MACHINES
BORING MACHINES
COLD SAW MACHINES
BORING, DRILLING AND MILLING MACHINES
DRILL AND TOOL GRINDERS
PLANERS
SLOTTERS
RAILROAD SHOP TOOLS
AUTOMOTIVE TOOLS
AND OTHER SPECIAL MACHINES

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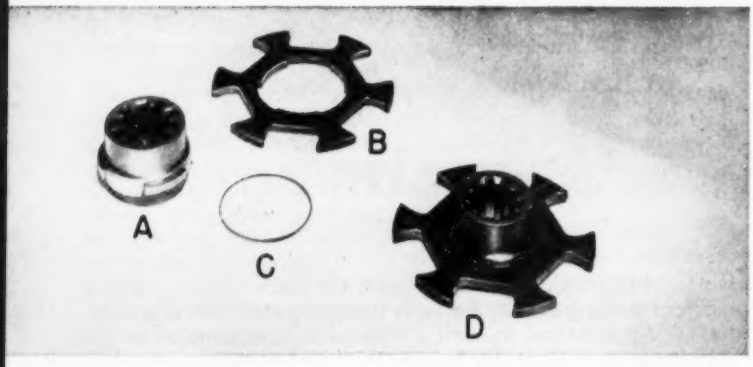
CONSOLIDATED
MACHINE TOOL CORPORATION

SUBSIDIARY OF FARREL-BIRMINGHAM COMPANY, INCORPORATED

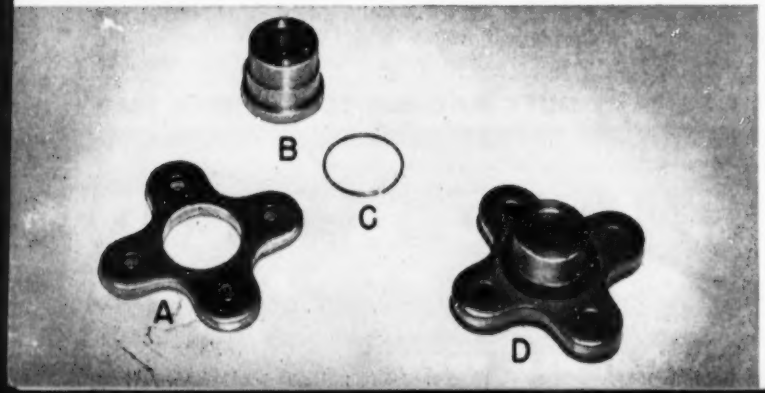
ROCHESTER, NEW YORK

1 **FURNACE BRAZING ALUMINUM ALLOYS** offers you many advantages: (1) cost is lower than either gas or arc welding, (2) brazed parts have a neater finish, (3) furnace brazing is easily adaptable to production line methods, and (4) sections too thin for welding can be brazed successfully. An increasing number of aluminum assemblies such as the refrigerator evaporators above are being fabricated by furnace brazing.

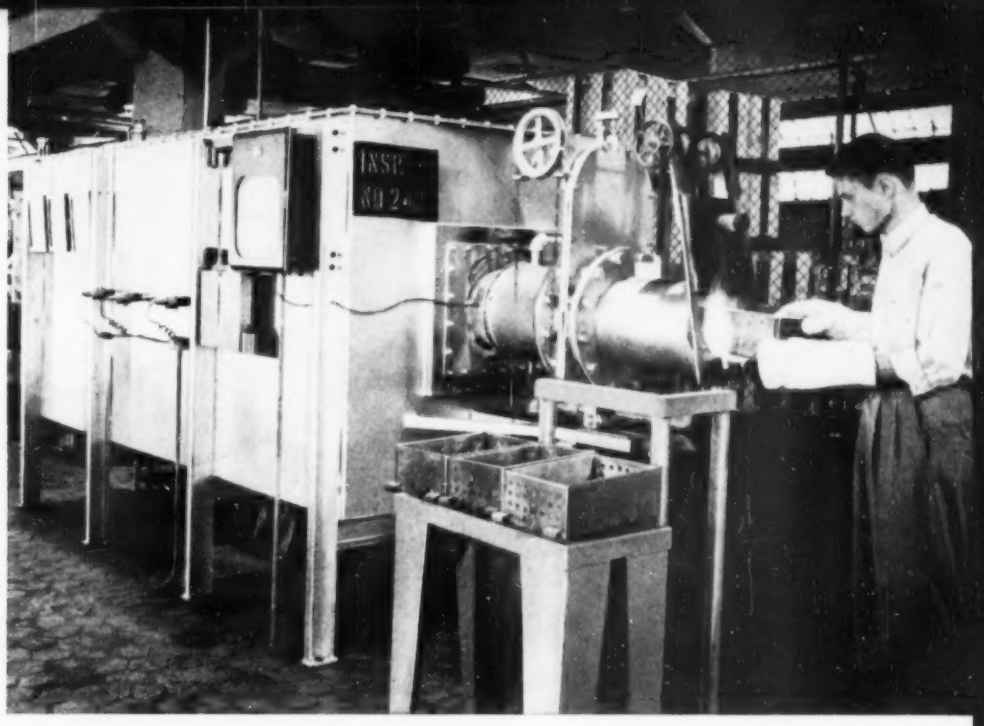
Five Brazing Applications



3 **SAVINGS OF 15 CENTS EACH** are reported on the fabrication of this clutch hub by furnace brazing. When formerly forged the assembly required expensive machining on the flange. For furnace brazing the operations are simple. The splined hub **A** is assembled with the punched flange **B** made from black hot-rolled steel, with the copper ring **C** placed at the joint. The hole in the flange is simply punched, with no reaming or broaching operation necessary. Serviceability of the furnace-brazed assembly is reported to be excellent.



4 **SAVINGS OF 66% IN MATERIAL** and 2½ cents on each pulley are the result of fabricating this assembly by furnace brazing. When formerly forged the part was cut from a section of bar stock about 2¾ in. in diameter and weighing about 1½ lbs. Now, in furnace brazing, parts made from blanks weighing only ½ lb are used. The process is accomplished by brazing punching **A** to screw machine part **B** with copper ring **C** to form assembly **D**.



2 BRIGHT BRAZING STAINLESS STEEL without flux in this semi-continuous furnace eliminates the characteristic green chromium-oxide and flux deposit. Because parts come out bright and shiny, no cleaning operations are necessary. Stainless assemblies such as the jet engine parts shown at left before and after brazing are brazed in protective atmospheres of pure dry hydrogen or dissociated ammonia in metal retorts.

That Can Save You Money

5 INDUCTION HEAT FOR SILVER BRAZING stainless steel helps this user increase production 50%, reduce rejects, eliminate leakers, and get uniformly stronger joints. Here, an operator brazes two stainless-steel nipples at a time into the stainless-steel head of a heater tank. Savings of 25% in silver solder are made possible with induction heat. Formerly, hand torches were used to perform this operation with non-uniform results and considerably more rejects.

For more information on how to apply brazing to your operations, contact the Heating Specialist in your nearest G-E Apparatus Sales Office. His years of experience involving every type of heating installation will be useful to you in solving your heating problems. General Electric Company, Schenectady 5, New York. 720-103

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Choose Your Wrenches as you do your friends--for life

Specify ARMSTRONG Wrenches for lifetime service, for finely balanced tools that feel right in the hand and make work easier, faster and less fatiguing. ARMSTRONG Wrenches generally are longer for size—give greater leverage. Accurately milled or broached openings give the proper clearance. They are safe wrenches because they are strong beyond need.

Drop forged and machined from high tensile carbon or special alloy tool steels, ARMSTRONG Wrenches are heat treated, tempered and tested to an exact balance of toughness, hardness and tensile strength. Each is beautiful in finish and line, is a quality tool to be proudly possessed by any mechanic—or certain to "give a lift" to any assembly line. Buy wrenches which carry the trade marks HI-TEN or ARMALOY. On carbon or alloy steel wrenches these trade marks are your guarantee of lifetime quality.

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2 dim. working table; 17" x 12"; Panto. movement; Long. 12", trans. 8"; Spindle speeds (6) 2800-15,000 RPM; Motor drive.

Price.....$2511.00

H & K WSR 0 UNIVERSAL TOOL & CUTTER GRINDER

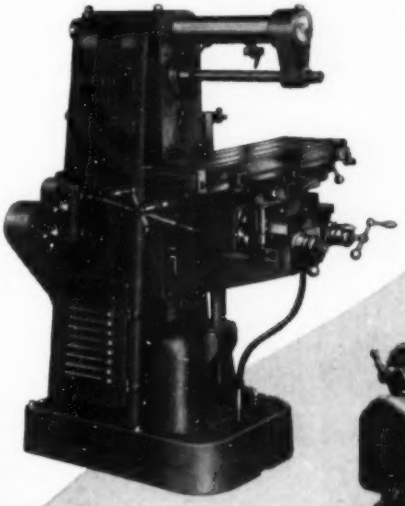
Table movement, Long. 16", cross 10"; Cylindrical grinding length 8-4/5"; Spindle speeds 3000-6000 RPM; Motor 1 HP.

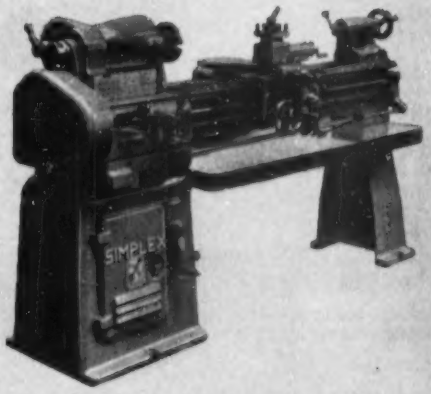
Price.....$2841.00

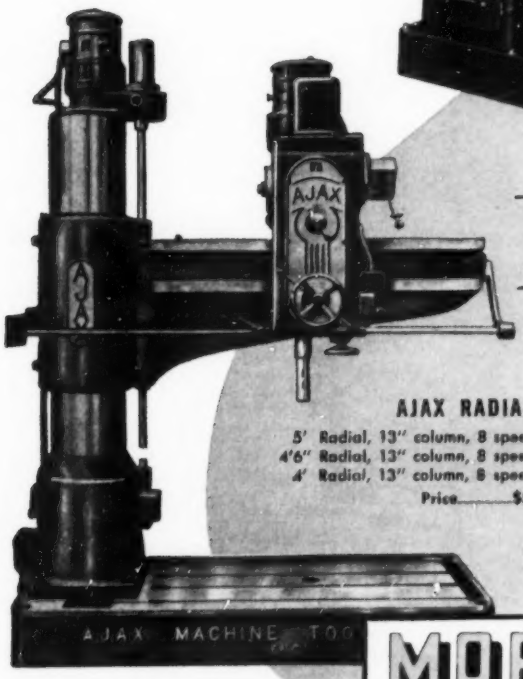
HERO MILLING MACHINE UNIVERSAL 4U (Illustrated) PLAIN 4P

Size of table 30" x 9¼" with 3 T-slots; Long. power travel 18"; Spindle speeds (12) 53-1250 RPM; Motor 2½ HP; Anti-friction bearings; Large table 40" x 9¼" as extra; Accessories available.

Price 4U $2795.00
Price 4P $2660.00







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Engine gap lathes. Quick change gear. Spindle speeds (12) 47-900 RPM; Motor drive.

Price 30".....$1995.00
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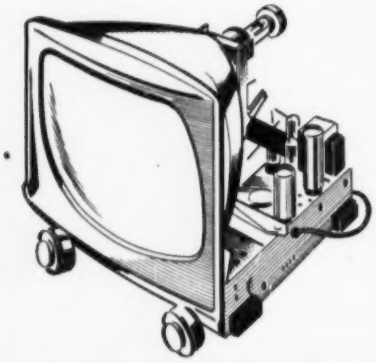
UNBRAKO SELF-LOCKING SOCKET SET SCREWS feature the following advantages: knurled cup point that won't work loose; accurate hex socket for nonslip, positive drive; fully formed threads—Class 3 fit; heat treated alloy steel for strength; standard sizes—#4 to 1"—in a full range of lengths.



USE UNBRAKO SELF-LOCKING SOCKET SET SCREWS wherever ordinary cup point set screws are used . . . on radios, television sets and electronic equipment.

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9 times out of 10 a standard UNBRAKO will do the job

A special socket screw may not be necessary, a standard UNBRAKO usually does the same job—much cheaper. Your local industrial distributor stocks Standards. He gives immediate attention to your requirements, and such extras as special delivery to your plant. Write for a copy of UNBRAKO Standards. SPS, Jenkintown 1, Pa.

UNBRAKO® SOCKET SCREW DIVISION

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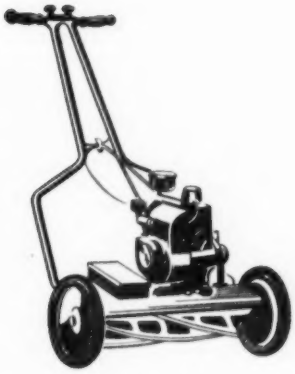
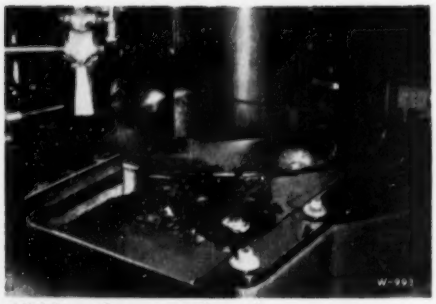
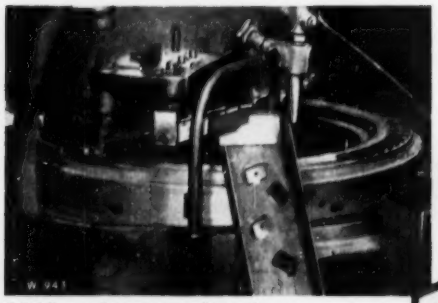


On power mowers, power saws and other power tools.

UNBRAKO Standards—as listed in the SPS Catalog—are stocked by leading industrial distributors everywhere.

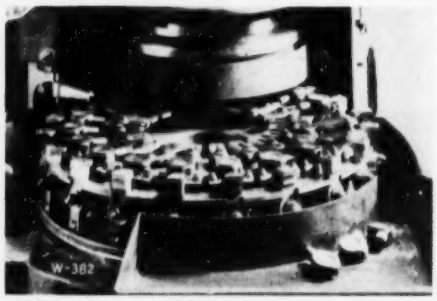


4360 surfaces per hour!



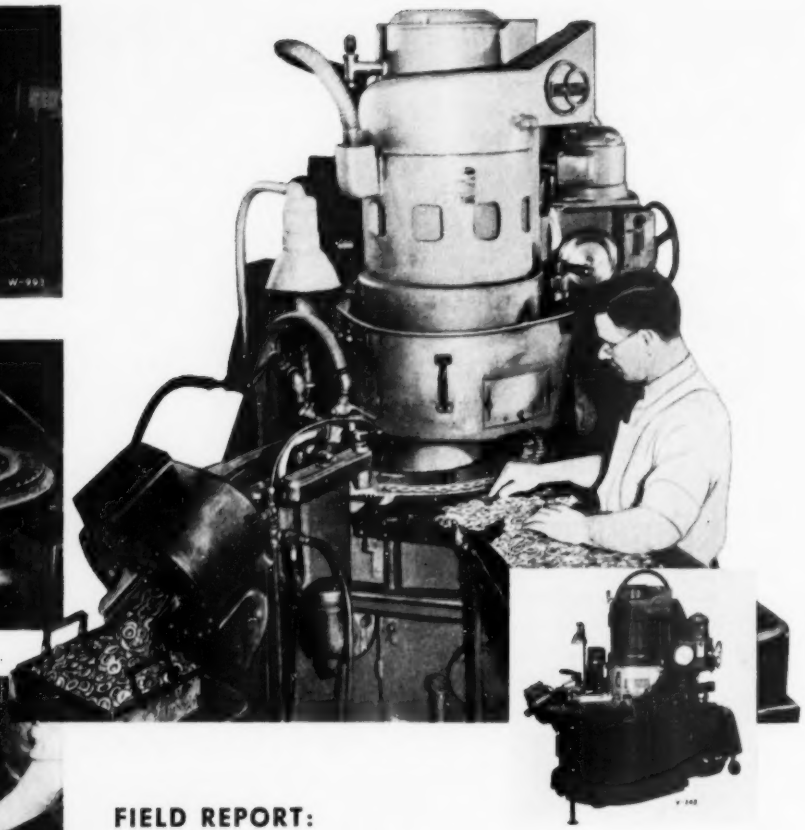
2000 surfaces per hour!

940 surfaces per hour!



900 surfaces per hour!

1400 surfaces per hour!



FIELD REPORT:

... a Blanchard No. 16-A Surface Grinder saved them $39,000 in 2½ years! (cost approx. $12,500) Their order follows for a Blanchard No. 16-A2!

Here's proof of performance and proof of satisfaction, yet typical of what users expect *and get* from the Blanchard 16-A Surface Grinder. Several typical examples of production rates are shown here. Above, for instance, .003" of stock is being removed from one side of small gears to a tolerance of ±.001" *at a rate of 2100 per hour!* This machine has a 30" chuck and a Blanchard Demagnetizer.

The No. 16-A grinds continuously with a wheel that is set and automatically maintained at a fixed height above chuck face, and finishes one surface of the work to size in one pass under wheel. Operator has only to load the work on the magnetic chuck or in an automatic clamping fixture. A wheel control automatically feeds the head down to compensate for wheel wear. Unloading is usually automatic. Attachments can be supplied for demagnetizing and washing the work as it leaves the grinder. On most work, limits of ±.0005" are readily maintained.

The No. 16-A2 (not shown) has two wheels, each with automatic size control. It roughs and finishes one surface of the work in one pass through the machine.

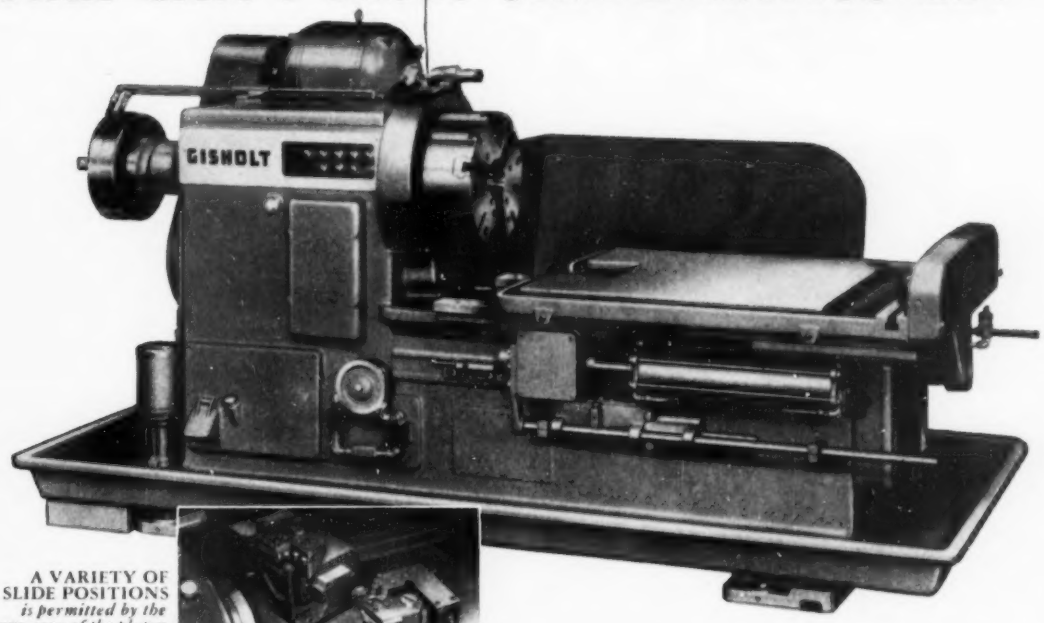
Send for your free copies of "Work Done on the Blanchard", fourth edition, and "Art of Blanchard Surface Grinding".

PUT IT ON THE BLANCHARD

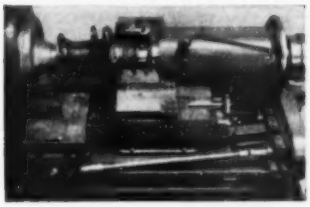
THE BLANCHARD MACHINE CO.

64 STATE ST., CAMBRIDGE 39, MASS., U. S. A.

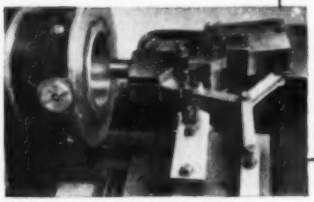
What CAN'T these SIMPLIMATICS do?



A VARIETY OF SLIDE POSITIONS *is permitted by the large area of the platen table. Angular feeds are no problem. Compound slides are unnecessary.*



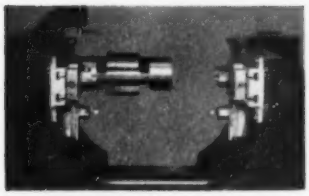
TAILSTOCKS *can be mounted on platen table for between-centers work; can be operated by hand or pneumatically.*



A LINKAGE ARRANGEMENT *between the slides can be used for spherical boring in conjunction with facing and turning.*

It's this simple basic design that makes the Simplimatic so readily adaptable to solve a variety of machining problems. It's a standard machine—yet it can be individualized to give you the high speed production of an automatic lathe designed solely for the job at hand. Think of the difference in cost.

The adaptations shown here are only a few of the almost unlimited possibilities of the Simplimatic. When you have a "special" job of machining parts in large volume, look into the Simplimatic before you build a special machine. The chances are good you'll save time and money.



SIMULTANEOUS DOUBLE END MACHINING *is possible with full utilization of base machine.*

VERTICAL HEAD. *Tool slides can also be mounted on a vertical instead of horizontal platen. A choice of arrangements is possible.*

THE GISHOLT ROUND TABLE *represents the collective experience of specialists in the machining, surface-finishing and balancing of round and partly round parts. Your problems are welcomed here.*

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

TURRET LATHES • AUTOMATIC LATHES • SUPERFINISHERS • BALANCERS • SPECIAL MACHINES

One Sundstrand Automatic Lathe Replaces 3 Other Machines

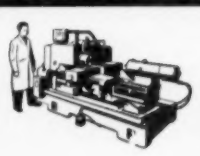
Here's a Sundstrand Model 8A Automatic Lathe in operation in the Columbia Tool and Die Company of Minneapolis. It is used for turning and facing five different pump rotors and three different covers. Previously these parts were turned on three different conventional turning machines using three operations. With this one Sundstrand installation, the same amount of work is done 2-1/2 times faster. Production increases and savings like these are commonplace with Sundstrand Automatic Lathes. Investigate their possibilities on your work. A Sundstrand engineer will be glad to help. There is no obligation for this service.

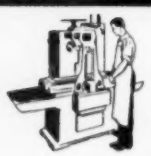
SUNDSTRAND

*"Engineered Production" Service**

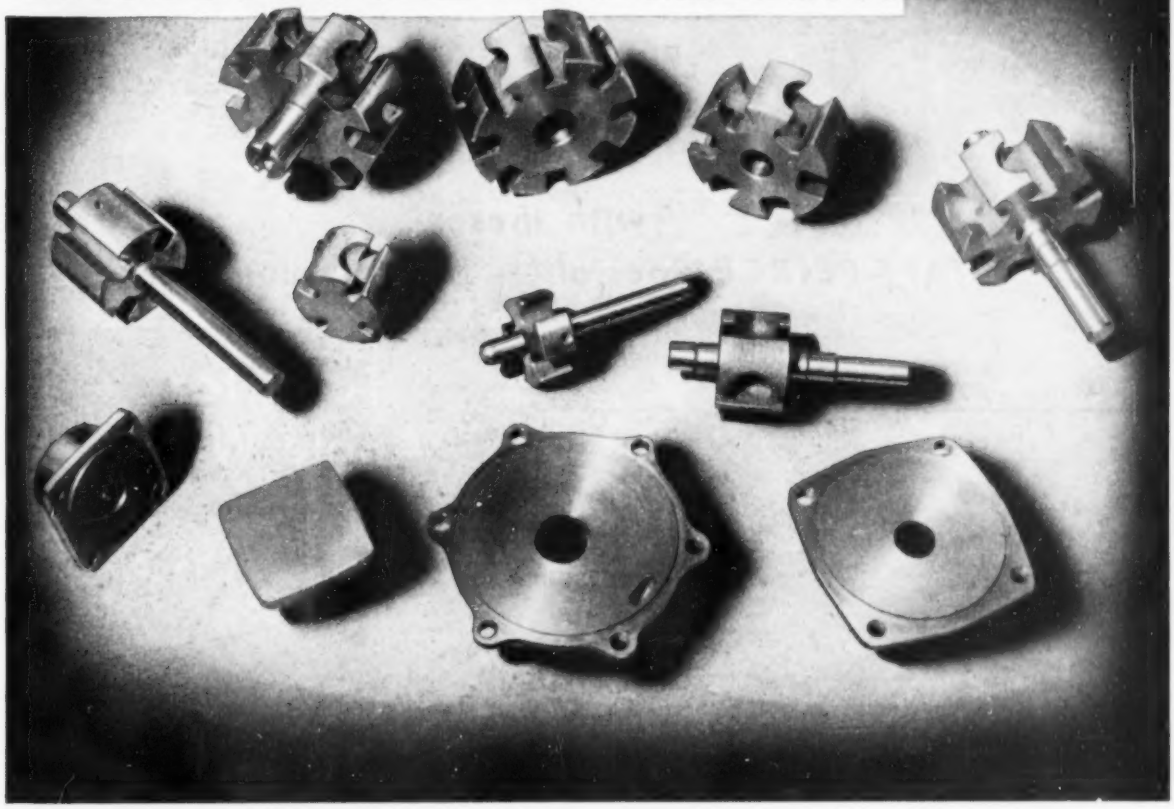
*REG. U.S. PAT. OFF.

AUTOMATIC LATHES | SIMPLEX RIGIDMILS | DUPLEX RIGIDMILS





Increased 2½ Times...



...In Lot Sizes of 100 to 500 Parts

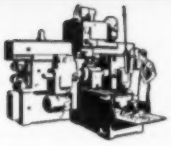
Parts are turned in lot sizes of 100 to 500 pieces. Operations consist of . . (1) Face one side, turn 1/2 of O.D. and core drill . . (2) Face opposite side and turn opposite end . . (3) Finish face both sides. Production for each operation on parts of Ni-resist material is 60 per hour — on cast iron parts, 120 per hour.

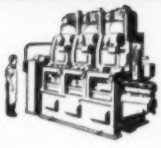
Work is held to .001" tolerance. Simplicity of set-up is the most important factor in making the multiple-tooled Sundstrand Automatic Lathes practical and profitable on short-run turning.

Free Data

The complete line of Sundstrand Automatic Lathes includes the Models 4A, 6A, 8A, 12A and 16A ranging from 3 to 75 HP. Write for complete information on these machines today. Ask for bulletin 133.

TRIPLEX RIGIDMILS | SPECIAL MACHINES



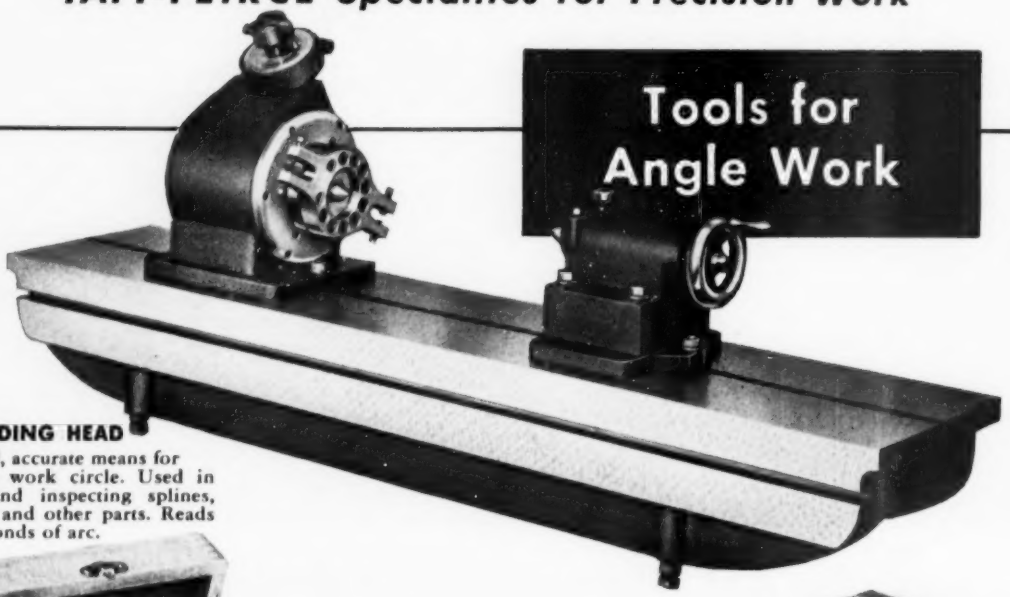


SUNDSTRAND
Machine Tool Co.
2533 Eleventh St. • Rockford, Ill., U.S.A.

Increase Production Range and Capacity

with these

TAFT-PEIRCE Specialties for Precision Work



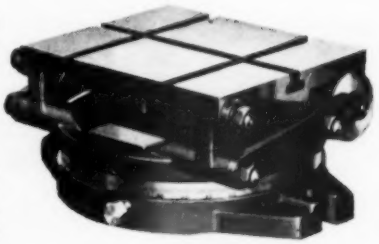
T-P DIVIDING HEAD
offers a rapid, accurate means for dividing the work circle. Used in measuring and inspecting splines, gears, cams, and other parts. Reads within 6 seconds of arc.

T-P SINE BARS & SINE BLOCKS
First conceived and built by Taft-Peirce, they locate work to any given angle within very close limits. Tapped holes permit clamping.

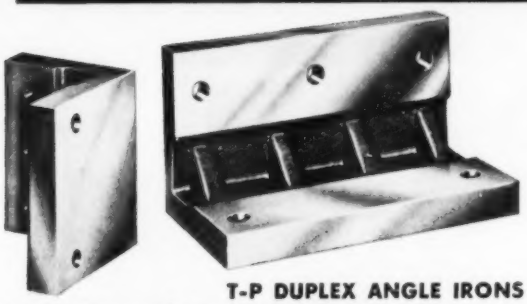
T-P TOOLMAKER'S ADJUSTABLE KNEE
simplify inspection or setup of angular work. Graduated quadrant and vernier reads to 5 minutes of angle.

T-P ANGLE BLOCKS
speed setup and grinding of small angular work on a magnetic chuck. Can be used individually or in any combination to form V-blocks.

T-P ADJUSTABLE ANGLE PLATE
tilts and turns. Makes compound angles easy to setup for machining. Both tilting table and rotating base are graduated from 0 to 90 degrees in each direction.

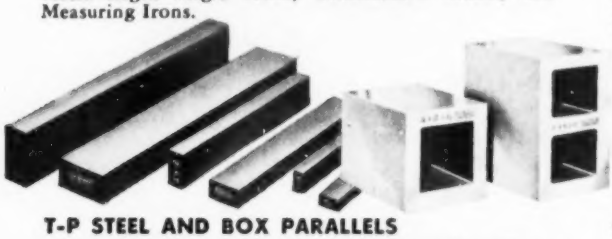


Reference Surface Tools



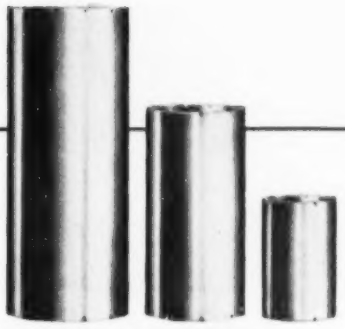
T-P DUPLEX ANGLE IRONS

Finished inner pads increase accuracy, permit faster setups. Other types available include Slotted Angle Irons, Universal Right Angle Irons, Toolmaker's Knees, and Measuring Irons.



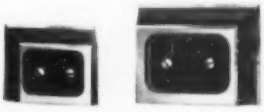
T-P STEEL AND BOX PARALLELS

are available in a complete line of stock sizes. Also, Planer and Boring Machine Parallels, Levelling Straight Edges, and Steel Straight Edges.



T-P CYLINDRICAL SQUARES

Used with T-P Surface Plate they provide a convenient, accurate reference line for any vertical work-surface.



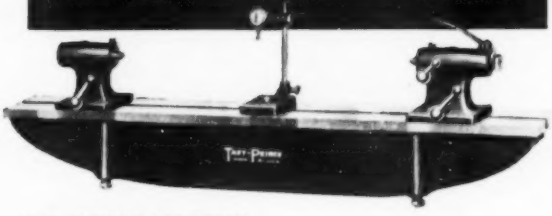
T-P UNIVERSAL SQUARES

High precision squares that can be used in any position. Hard rubber center facilitates gripping . . . prevents hand heat from reaching block.

T-P SURFACE PLATES

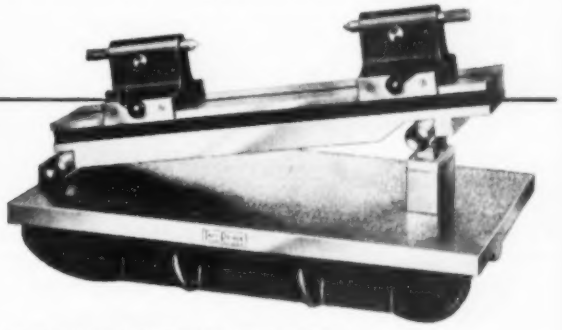
One of a long line of standard sizes. Rigid. Heavier than average. Extra thick top permits refinishing, if plate wears.

Versatile Inspection Tools



T-P BENCH CENTERS

simplify inspection work. Have unusual rigidity and permanent accuracy. This is typical of a wide range of inspection tools available at Taft-Peirce.



T-P TAPER TESTING FIXTURE

combines a Sine Block with a pair of adjustable mounted precision centers. Checks tapers to high degree of accuracy.

For the complete story on these items and many more, get your copy of the Taft-Peirce Handbook.

T-P COMPARATOR SQUARE

permits accurate indication of squareness. Adaptable to both production and inspection work.

T-P means Top Precision

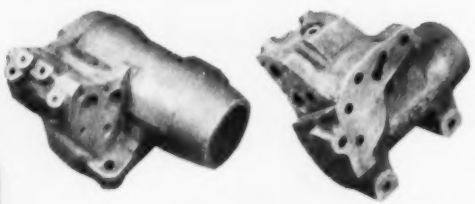
THE TAFT-PEIRCE MANUFACTURING COMPANY

WOONSOCKET, RHODE ISLAND

TRACTOR ENGINE PLANT

Speeds-Up Production with...

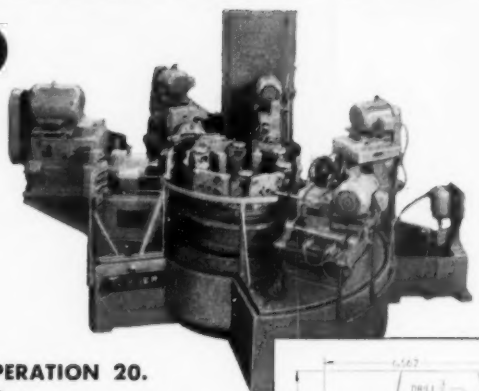
Five Turner special purpose machines perform *55 operations* to produce 80 hydraulic lift cylinders per hour at 80% efficiency per machine.*



In designing and building these special automatic indexing-type machines, Turner has solved a difficult problem of producing hydraulic lift cylinders at high speed, with maximum efficiency, yet at a low manufacturing cost. It was done by employing time and money-saving Turner manufacturing methods. For example, on Operation 90, Turner designed multiple spindle heads are used for drilling, reaming, counterboring, chamfering, spot-facing and tapping. Two castings in each fixture are machined at the same time in a two cycle operation, so that at the end of the first two cycles, a finished machined part comes off the table with each cycle thereafter. Where deep holes are needed, there is no time lag taken up by repeated passes of the drill. The work piece is indexed to a second and third station for completing deep drilling and equalizing the other operations. It insures uninterrupted machining at all stations at the same time. Follow the five illustrations for detailed sequence of operation of each machine.

Turner solves high production problems such as this by first studying the problem thoroughly, applying years of technical experience; then, by designing fixtures and spindle heads *exactly suited to your job.* With all of the Turner special purpose machines, standard bases and columns are used. This keeps manufacturing costs at a minimum. It means you are assured a machine specially designed for your application, yet without the high extra costs you might expect.

1



OPERATION 20.

Stations

No. 1 Load and Unload

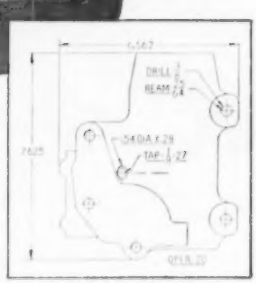
No. 2 Drill (5) 3/8 hole

No. 3 Ream (5) 25/64 holes

No. 4 End Drill .54 diameter x .28 counterbore

No. 5 Drill (1) 21/64 hole 1/4 deep for counterbore

No. 6 Tap 1/8 x 27 pipe thread



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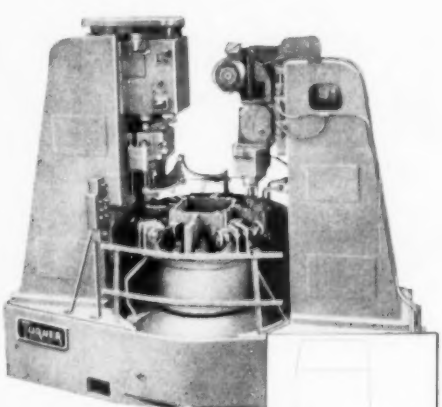


OPERATION 100.

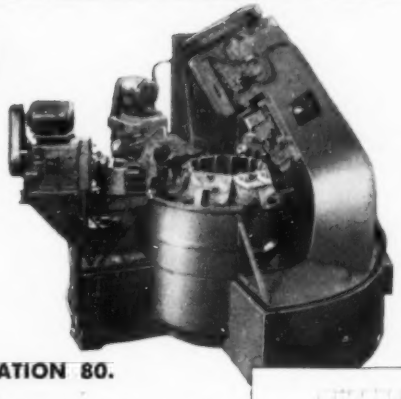
Stations

No. 1 Load and unload and transfer to other side of fixture.

No. 2 Tap drill (6) 3/8 x 16 holes. Combination ream 1/2 diameter and counterbore .565-.570 x .09 deep.

No. 3 Tap (6) 3/8 x 16 holes and (1) 5/16 x 18 hole.

TURNER Special Automatic Indexing-Type Machines!



OPERATION 80.

Stations

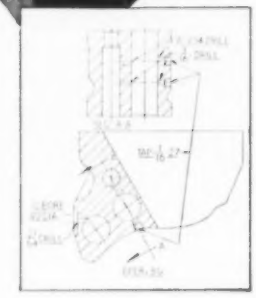
No. 1 Unload and transfer to other side of fixture

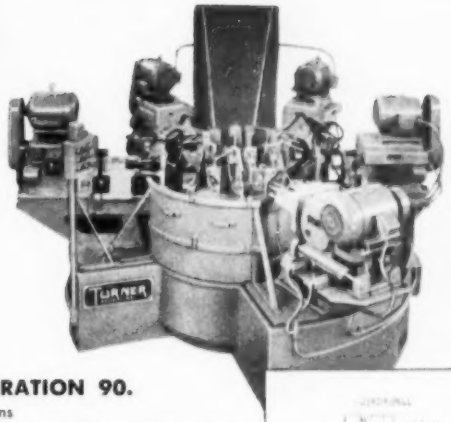
No. 2 Drill (1) "A" diameter hole through into 1.0002 bore, Step Drill (1) "A" diameter tap hole and 3/16 diameter into 1.0002 bore.

No. 3 Drill (1) "A" and (1) 3/16 diameter into .6865 hole.

No. 4 Tap (2) 1/16 x 27 dryseal pipe tap

No. 5 Drill 21/64 diameter x .75 deep and counterbore .92 diameter x .72 deep.





OPERATION 90.

Stations

No. 1 Unload and transfer to other side of fixture.

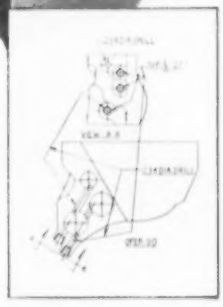
No. 2 Drill (4) .234 holes at bottom of (4) 1" holes through plug guide bushings.

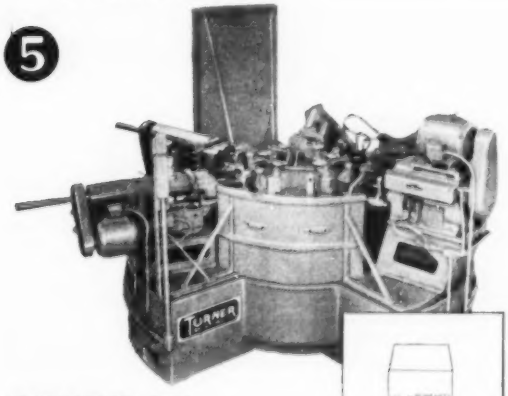
No. 3 Spot face (4) 3/16 x .234 dia.

No. 4 Drill (4) .234 holes.

No. 5 Drill (1) .234 hole into .6873 hole.

No. 6 Tap 1/16 x 27 pipe tap (3) holes.





OPERATION 110.

Stations

No. 1 Load and Unload

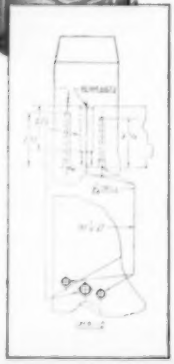
No. 2 Drill .234 diameter hole first step and drill 21/64 diameter hole first step.

No. 3 Drill .234 diameter hole and 21/64 diameter hole second step.

No. 4 Finish drill .234 and 21/64 holes.

No. 5 Tap 1/8" pipe tap and tap 1/16" pipe tap.

No. 6 Ream .6865-.6873 diameter.

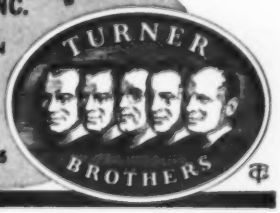


You'll find other Turner special purpose machines designed to meet difficult assembling and testing jobs, too; or, wherever special hydraulic presses, impregnating and flushing machines are needed to perform a tough job in the shortest possible time. Turner special automatic indexing-type machines are available from 2 to 36 stations in diameters up to 12 feet.

**The June issue of MACHINERY carries the complete tractor engine plant story. Reprints are available upon request from Turner Bros., Inc.*

If you have a production assembly or inspection problem where you can use to advantage a special purpose machine, write today describing your problem. After our engineering department analyzes it, our field engineer will discuss it with you.

TURNER BROS. INC.
2625 HILTON ROAD
FERNDALE 20, MICHIGAN
DESIGNERS and BUILDERS of:
• SPECIAL MACHINES
• JIGS and FIXTURES



CHANGE Resistance Welding Die Set-ups ... In a Matter of Seconds

Mallory "Nu-Twist*" Die Adaptors provide complete flexibility in welding operations with one die set-up

Now, you can switch from one job to another without changing dies . . . and you can do the entire job in a matter of seconds. Mallory "Nu-Twist" Die Adaptors are designed so that all the operator has to do is turn the locking nut by hand, slide out the electrode insert, slip in the one for the next job and turn the locking nut. It is simple as that . . . requires no tools.

Shops having small run resistance welding applications such as projection welding, single spot welding and electrical upsetting can effect substantial savings in set-up time and reduce die inventory. Die adaptor bases are custom designed to fit your machine specifications. Standard electrodes are available from stock. Special shapes can be designed to fit most requirements.

For complete information either write us or ask your Mallory Distributor for a copy of Technical Bulletin 8-28.

Expect more
Get more
from **MALLORY**

Electrode inserts give more flexibility... less down time.

Typical electrode for projection welding using an insulated locating pin.

Electrode insert for spot and mash welding, electrical upsetting or single projection welding.

Electrode insert for typical projection welding operation.

In Canada, made and sold by Johnson Matthey and Mallory Ltd., 110 Industry Street, Toronto 15, Ontario

RESISTANCE WELDING ELECTRODES, HOLDERS, DIES, RODS AND BARS, CASTINGS, FORGINGS

*Trade Mark, Patent Applied For

P. R. MALLORY & CO. Inc.
MALLORY

SERVING INDUSTRY WITH THESE PRODUCTS:
Electromechanical—Resistors • Switches • Television Tuners • Vibrators
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P. R. MALLORY & CO. INC., INDIANAPOLIS 6, INDIANA

For information on titanium developments, contact Mallory-Sharon Titanium Corp., Niles, Ohio

S. S. *United States* and Lower Manhattan, New York City — Robert Yarnall Richie Photo

The Invisible Background of Industrial Progress

Farsighted Industrial America is forging its maritime links with all parts of the world. For security and peacetime commerce, fast ships are more essential now than ever in our history. Free enterprise and initiative promote the development and construction of such engineering feats as the S. S. *United States*. Nine hundred and ninety feet in length, she is the largest American ship ever built. From her tremendous turbines and pumps down to lifeboat launching equipment and portholes, the equipment represents "The Invisible Background of Industrial Progress." ★ *Modern Machine Tools*, the basic means of machining interchangeable parts, make possible the fulfillment of such engineering enterprises.

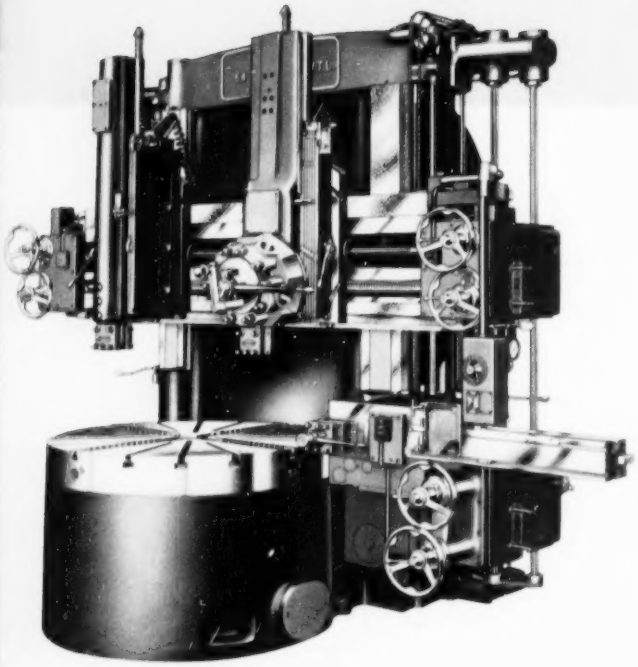
Bullard is indeed proud that many of the parts for the S. S. *United States* were machined on their equipment and that they have made their niche in American progress.

★ *For greater manufacturing economy REFER to next page.*

THE BULLARD COMPANY
BRIDGEPORT 2, CONNECTICUT

BULLARD MACHINE TOOLS FOR GREATER MANUFACTURING ECONOMY

The Bullard Cut Master Vertical Turret Lathes, built in six sizes 30-36-42-54-64 and 74″ with various head combinations, offer rigidity, accuracy, metal removing ability and convenience of operation, assuring profitable production on single piece jobs or on the long runs.



Manufacturing industries the world over know the versatility, accuracy and efficiency of Bullard Machine Tools. Among these are many who contributed to the building of the most modern ship *United States*.

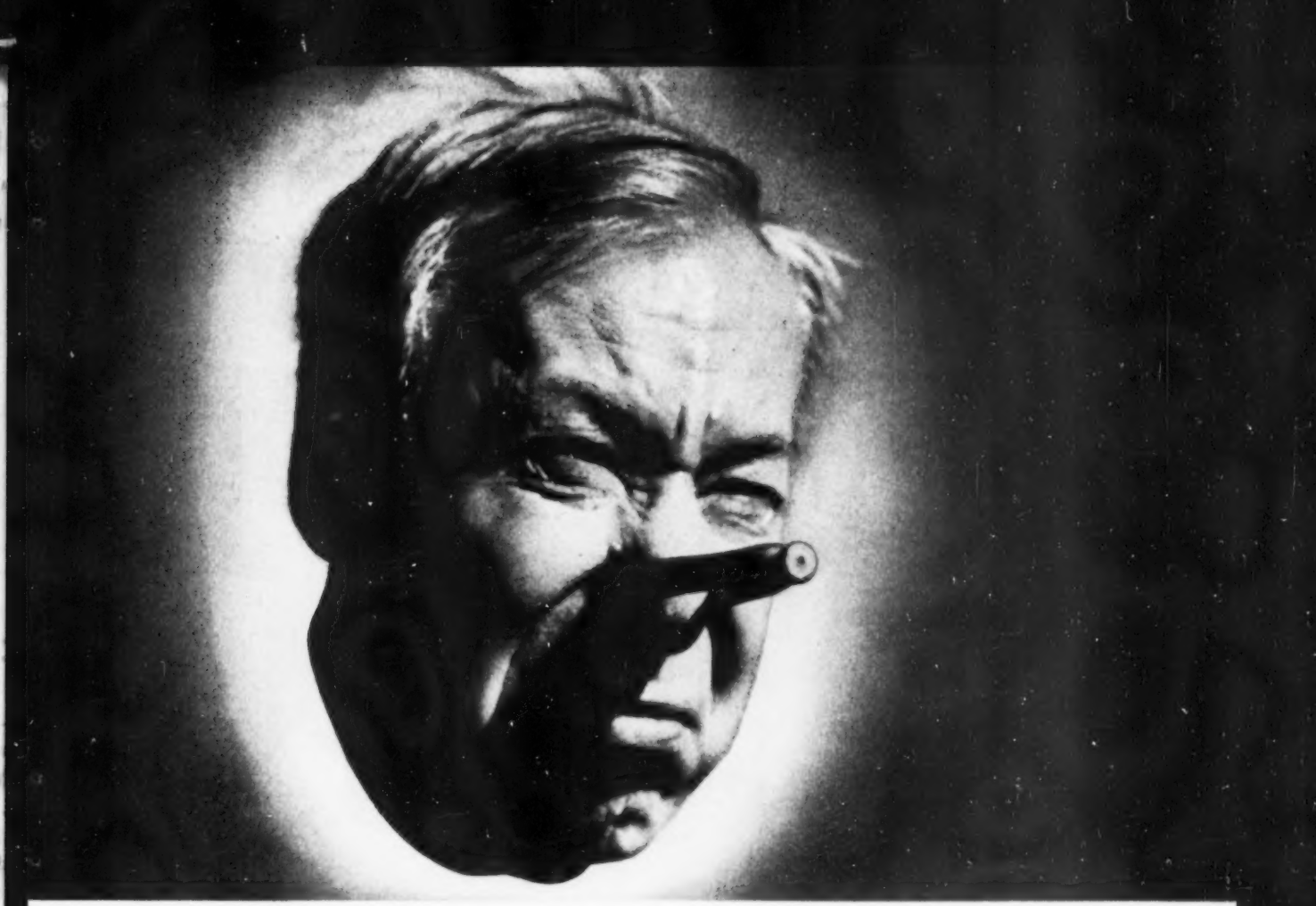
We proudly claim our part in this outstanding maritime project through manufacturers using Bullard machines in the production of pumps, compressors, valves, electric motors, turbines, shafts, gears for speed reducers, parts for winches and davits as well as the machining of every porthole frame.

Such broad acknowledgement of the use of Bullard machines bespeaks not only confidence in productive ability but an assurance of sound investment in manufacturing equipment.

BULLARD

Time saved is money earned. Write now for information on the six sizes of Cut Master Vertical Turret Lathes.

THE BULLARD COMPANY BRIDGEPORT 2, CONNECTICUT



HOW TO DEODORIZE A JOB . . .

Every operator in your shop will realize he has a *better job* when you take the stench out of it. And all you have to do is specify CIMCOOL.°

Cimcool is a radically new and different cutting fluid that virtually eliminates rancidity and foul odors—*even in the hottest weather!* It's a *chemical emulsion*. Can't burn. Can't smoke. Has no objectionable odor of its own.

And those aren't the only reasons why operators like their jobs better when Cimcool is on the job. Cimcool is clean to work with, doesn't soil hands or clothes. Leaves no hazardous slippery film on hands, machine, work or floor. Contains no skin irritants. And Cimcool cools so fast that tools and chips actually stay cool to the touch. You'll get *better production* when you make *jobs better* with Cimcool!

For a demonstration in one of your own machines, just write us and we'll have one of our Cincinnati Milling-trained machinists call on you —without cost or obligation. Or, if you prefer, write for our free booklet "Cimcool Defeats Heat." Address, Sales Manager, Cincinnati Milling Products Division, The Cincinnati Milling Machine Co., Cincinnati 9, Ohio.

°Trade Mark Reg. U.S. Pat. Off.

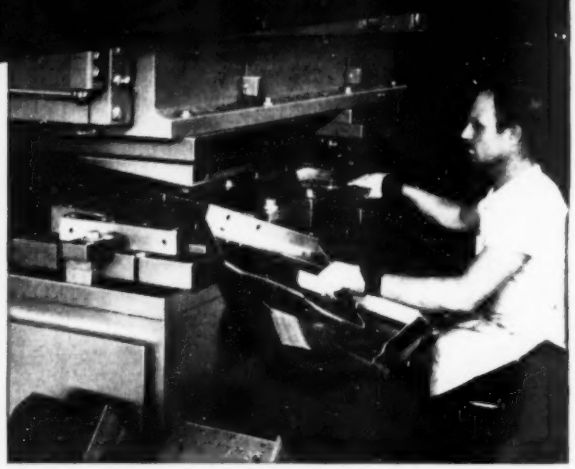
CIMCOOL

for 85% of all metal cutting jobs

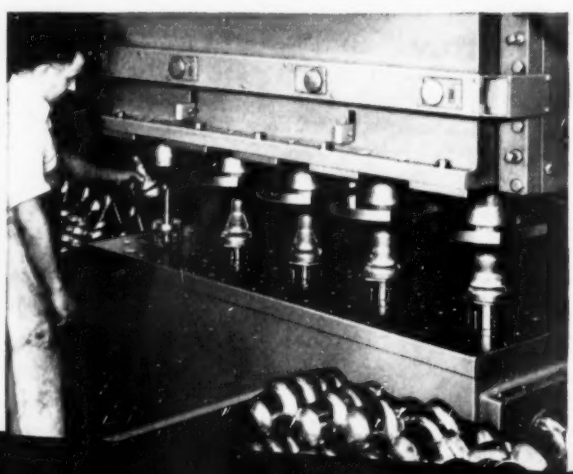
A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

NIAGARA

SERIES B
GAP FRAME Double Crank Presses



Niagara B-4 x 72 Press at the General Machine Works in Los Angeles. It is shown here fitted with two dies for forming operations on an automatic deflector.



The same press as shown above arranged with dies for redrawing projectile parts in 5 steps. Shells are transferred manually from die to die.

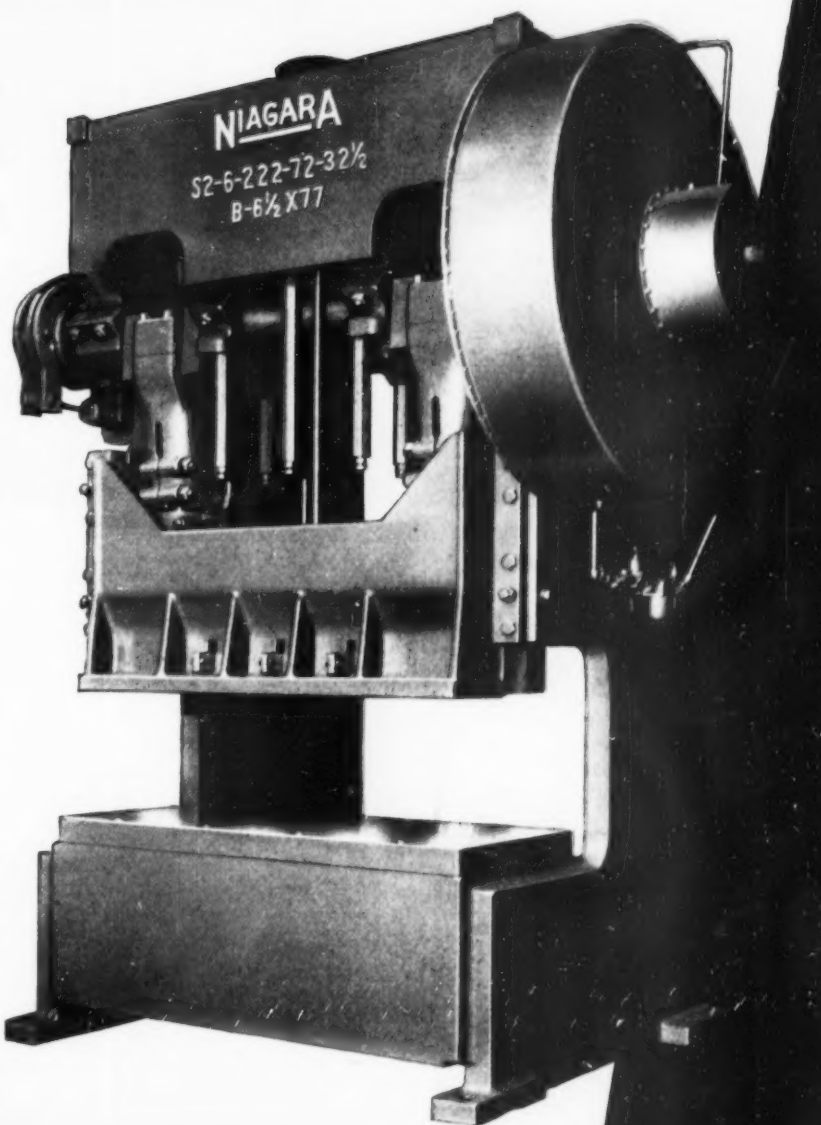
NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, N. Y.

Manufacturers of a complete line of sheet metal working equipment ranging from small hand tools up to large power operated machinery.

Versatility and High Production

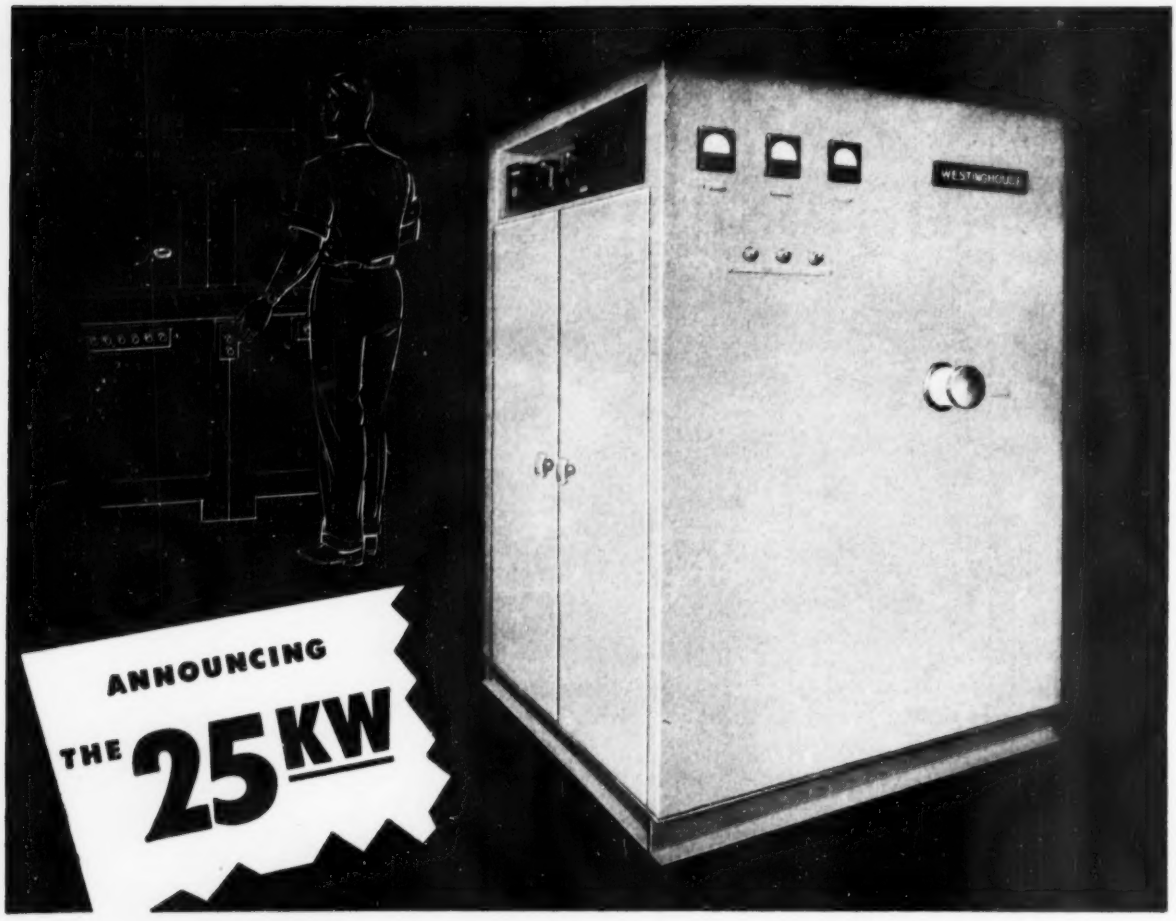
- Gap frame convenience with double crank width.
- Ideal for long progressive dies or multi-station dies.
- Rear of press open for full accessibility.
- One piece welded steel frame for maximum rigidity and long die life.
- Exclusive Niagara Sleeve Clutches for maximum productive strokes per minute and minimum maintenance cost.
- Niagara cushions for drawing operations.
- Automatic feeds for high production jobs.

Write for Bulletin



Niagara B-6½ x 77 Gap Frame Double Crank Press. Air actuated, electrically controlled sleeve clutch with friction clutch convenience and sleeve clutch economy. Air releasing brake. Clutch and gearing operating in a bath of oil. Air counterbalance for slide with surge tank over-size cylinder and pressure regulating valve to compensate for various weights of dies. Cross bar knockout in slide. V-belt motor drive.

DISTRICT OFFICES: NEW YORK • CLEVELAND • DETROIT • PHILADELPHIA



NEW HF GENERATOR PUTS FULL POWER

EVEN INTO LOOSE-COUPLED COILS AND NON-FERROUS LOADS

Westinghouse now presents a new high-frequency generator with 25 KW output at 100% duty cycle. For optimum performance, the new 25 KW has a tank kva of 1620. This means you can now put full power into a wider variety of loads . . . even where close coil coupling is impractical. Non-ferrous materials, like brass, copper and aluminum, can be heated in much shorter time. You benefit in higher production rates at lower costs.

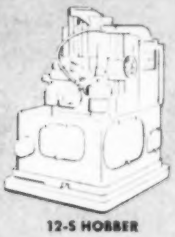
This latest addition to the Westinghouse line of induction heating tools has many more outstanding benefits. Here are some of them:

- Allows positive, precise heat control of short production runs on a variety of jobs . . . or long production runs with rapid heat cycles. The built-in electronic keying of power output that makes this possible also eliminates main contactor arcing.
- Provides smooth variation of power output from 25% to 100%. This simplified power output system utilizes dependable, maintenance-free saturable reactors and longer-life, cost-cutting diode rectifier tubes.
- Gives complete protection against condensation and water-impurity troubles. The built-in distilled water cooling system and heat exchanger offers substantial raw water economy, too.
- Assures long tube life, peak performance and minimum maintenance by close regulation of filament voltages.
- Offers easy inspection and maintenance through the full-opening double doors; easier operation through a simplified combination of conveniently located controls.

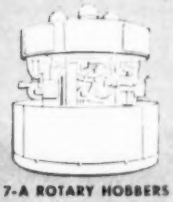
The new Westinghouse 25 KW RF Generator is available now in this de luxe model. A standard model is also available with electronic keying and smooth power output control features as easily-installed optional accessories. Both models offer flexible, economical handling of hardening, annealing and metals-joining jobs. For full information write: Westinghouse Electric Corporation, Electronics Division, Induction Heating Section, 2519 Wilkens Avenue, Baltimore 3, Maryland.

YOU CAN BE SURE...IF IT'S **Westinghouse**

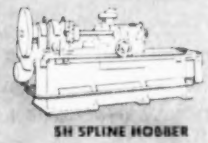
J-02270



12-S HOBBER

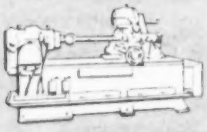


7-A ROTARY HOBBERS

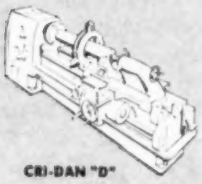


5H SPLINE HOBBER

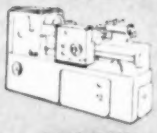
MODEL 40 THREAD MILLER



HT THREAD MILLER



CRI-DAN "D"



CRI-DAN "B"

FAST THREADING for FLYING HORSEPOWER!

with the AMAZING CRI-DAN "D"

Speed-threading with unusual accuracy is nothing new for the Cri-Dan "D". But as the machine's reputation spreads, it is given tougher and tougher jobs to perform.

In this case it is threading an aircraft radial engine cylinder barrel with a 6-pitch, special buttress thread. Using a single point carbide tool and running at 200 RPM, the operation was completed in 10 passes requiring 50 seconds for the operation.

If you, too, have difficult threading jobs requiring speed as well as accuracy it will pay you to learn the facts about the Cri-Dan "D". For additional information get in touch with your Lees-Bradner representative—or write to us direct.

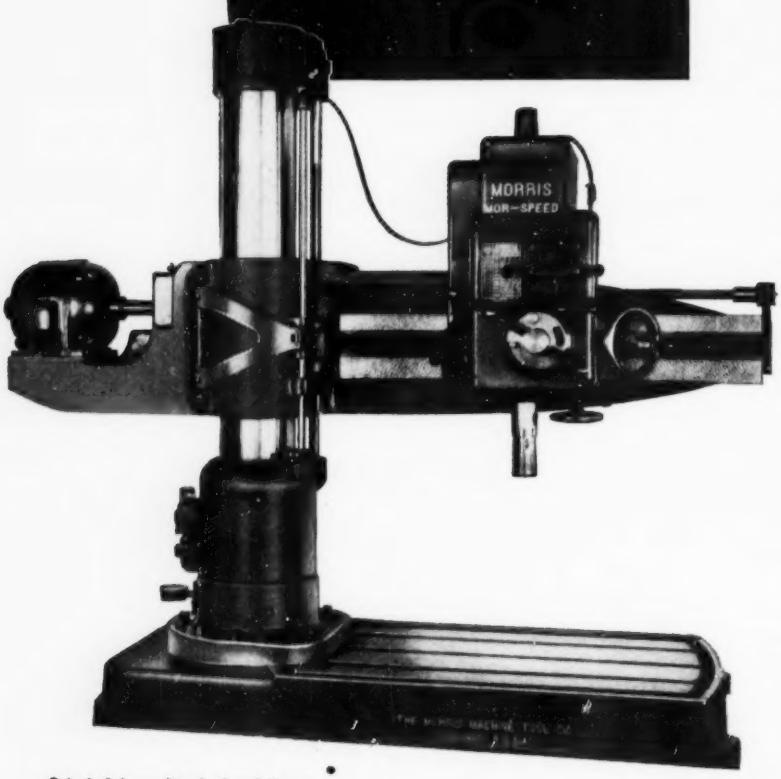
the LEES-BRADNER Company

CLEVELAND 11, OHIO, U.S.A.

get speed...
safety...
accuracy...
with

MORRIS

MOR-SPEED
RADIAL DRILLS



completely centralized controls . . .

On a MORRIS Mor-Speed Radial Drill every control is in sight . . . within reach . . . easy to operate fumble free!

The operator makes speed, feed and other adjustments, quickly and easily—concentrates on job, rather than on bending, stepping, stooping or reaching for awkward controls. A wide selection of automatic stops and trips cut time per operation to a minimum. Carefully designed, tested safety devices assure complete protection to machine, operator and work. Alloy steels, modern hardening methods and anti-friction bearings . . . at every wear-vulnerable point . . . plus constant lubrication for all operating parts, protect and maintain precision and make Mor-Speed Radials capable of higher production over longer periods of time.

Find out how MORRIS Mor-Speed Radial Drills can make precision work possible and profitable for you, even under your heaviest scheduling demands.

WRITE FOR BULLETIN NO. 59
Early delivery dates available.

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9-inch Column Standard and Heavy Duty models with 3 and 4-foot arms.

11-inch Column Heavy Duty models with 3, 4, 5, and 6-foot arms.

a better product at less cost —with precision PLUS *production*

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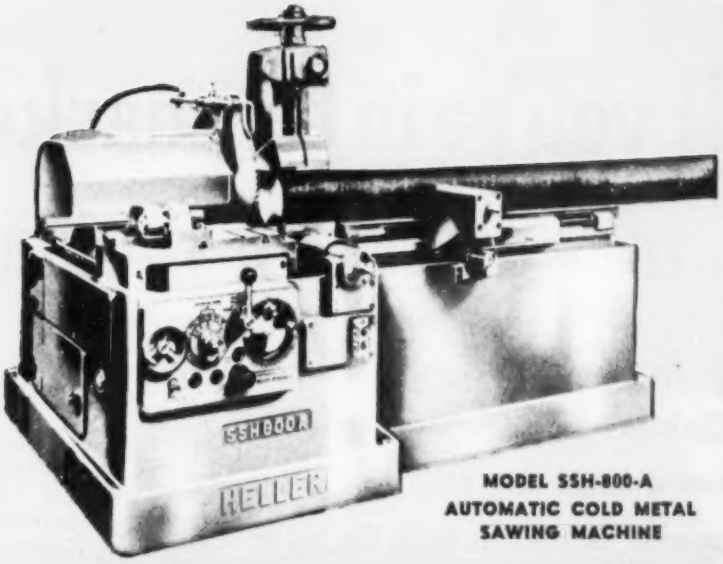
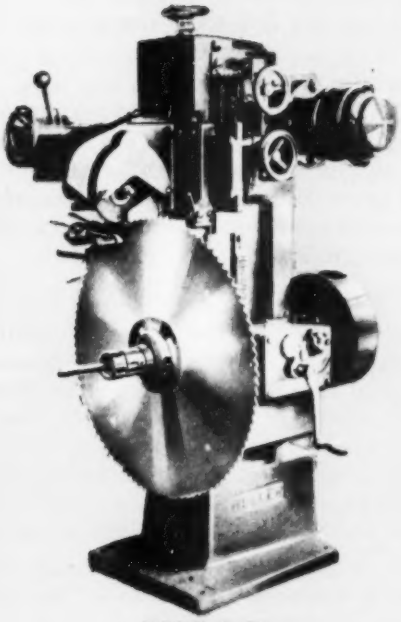


MODEL SSH-800-A
AUTOMATIC COLD METAL
SAWING MACHINE

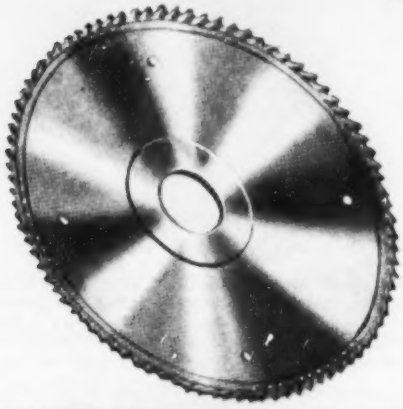


MODEL B-650
AUTOMATIC SAW SHARPENING
MACHINE

Cutting Costs and
Increasing Efficiency with

HELLER

COLD SAWING MACHINES
BLADE SHARPENING MACHINES
AND SAW BLADES



HELLER GIVES YOU COMPLETE SERVICE WITH
EXACTLY CORRECT BLADES.

Heller High Efficiency Cold Metal Sawing Machines are built in both manual and fully automatic types in machine sizes ranging from 3" bar capacity up to 48" billet capacity and blade sizes from 12" to 120" diameter. They are full hydraulic with completely centralized operating control. Illustration shows our SSH-800-A full automatic with bar capacity to 10" round stock.

The Model B-650 machine shown represents a new construction in arrangement and operating features. Using change gears and built-in dividing head, it insures a true tooth pitch and form and eliminates the use of a variety of master index plates for varying diameters and pitches of saw blades. Machine is rigidly constructed to secure extremely high grinding capacity and performance and produces a true and correct cutting tooth shape. Machines built in five sizes for 2½" to 120" diameter saw blades.

Importing Heller Machines Since 1926

HELLER MACHINE COMPANY, 114 Liberty St., New York 6, N. Y.

KNEE AND PLANER TYPE MILLING MACHINES • RADIAL AND COLUMN DRILLING MACHINES • TRANSFER MACHINES • SPECIAL MACHINES

If you're in the market for special machines or special tooling...

Kearney & Trecker Special Machinery Division—an old hand in the business—has a brand new plant and greatly expanded facilities to build the big or small special equipment you need

THOUGH we've designed and built up to $3,000,000 worth of special machinery annually . . . have been in the field since 1898 . . . we've never publicized the fact till recently. Limited production facilities prevented taking additional orders.

But now we have a new plant built exclusively to produce special machines, special tooling and special adaptations of standard equipment. This plant, with approximately 200,000 sq. ft. of floor space, is equipped with more than $2,500,000 worth of the very latest tools and equipment. It's at your service.

We've worked with the best of them

In practically every industry . . . automotive, shoe machinery, aviation, etc. . . . there have been many installations of Kearney & Trecker special machines. These machines were custom-built to solve unusual metalworking problems. They provide extremely high production even with exacting dimensional accuracy and fine surface finish requirements.

We're staffed with engineers who have learned the business from the ground up

Our Special Machinery Division engineering section has almost 100 widely-experienced design, project and production engineers. These men are up-to-the-minute on the latest developments in applied mechanics, hydraulics, electronics, metallurgy and allied fields. They know exactly how to utilize these advances in the design and construction of outstanding special machine tools. In addition, it has a full complement of experienced machinists and mechanics needed for special machine construction.

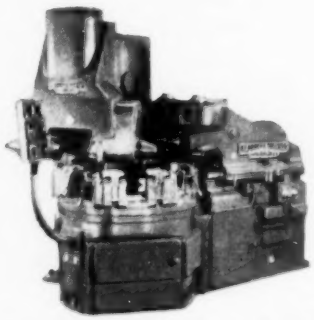
Every special machine is backed by the entire Kearney & Trecker organization

The Special Machinery Division is an integral part of Kearney & Trecker, a corporation that does an annual business in excess of $25,000,000. Every product, every commitment we make, is fully backed by our reputation for quality, cooperation and ability to live up to promises. Every machine is designed, then built, to your specific requirements with ample reserve for emergencies.

We invite your inquiry

We'll be glad to provide you with any information we can . . . including sample machine specification sheets on typical installations, a brochure covering the expanded facilities of our Special Machinery Division, and details on our Customer Engineering Service. Furthermore, if you have special production machinery problems, have one of our senior Project Engineers analyze them, without obligation, of course.

Write, wire or phone the Special Machinery Division, Kearney & Trecker Corp., 6784 W. National Ave., Milwaukee 14, Wisconsin.



We've built special machines or adaptations of standard equipment for practically every industry. Here is a photo of a three-station rotary indexing machine we designed and built for a major automotive manufacturer.

KEARNEY & TRECKER MILWAUKEE MACHINE TOOLS

Hayes Scientific Appliances, Urbana, Illinois, often checks work done on their Cincinnati Tray-Top Toolroom Lathe with Zeiss Micrometers, and gets results consistent with inspections with gage blocks on a comparator! This, we think, is dramatic proof that you can do fancy lathe work on Cincinnati Tray-Tops at un-fancy prices. Ask your nearby dealer to show how and why balanced design Cincinnati Tray-Tops deliver important bonuses in precision as well as production.

best buys in their class!

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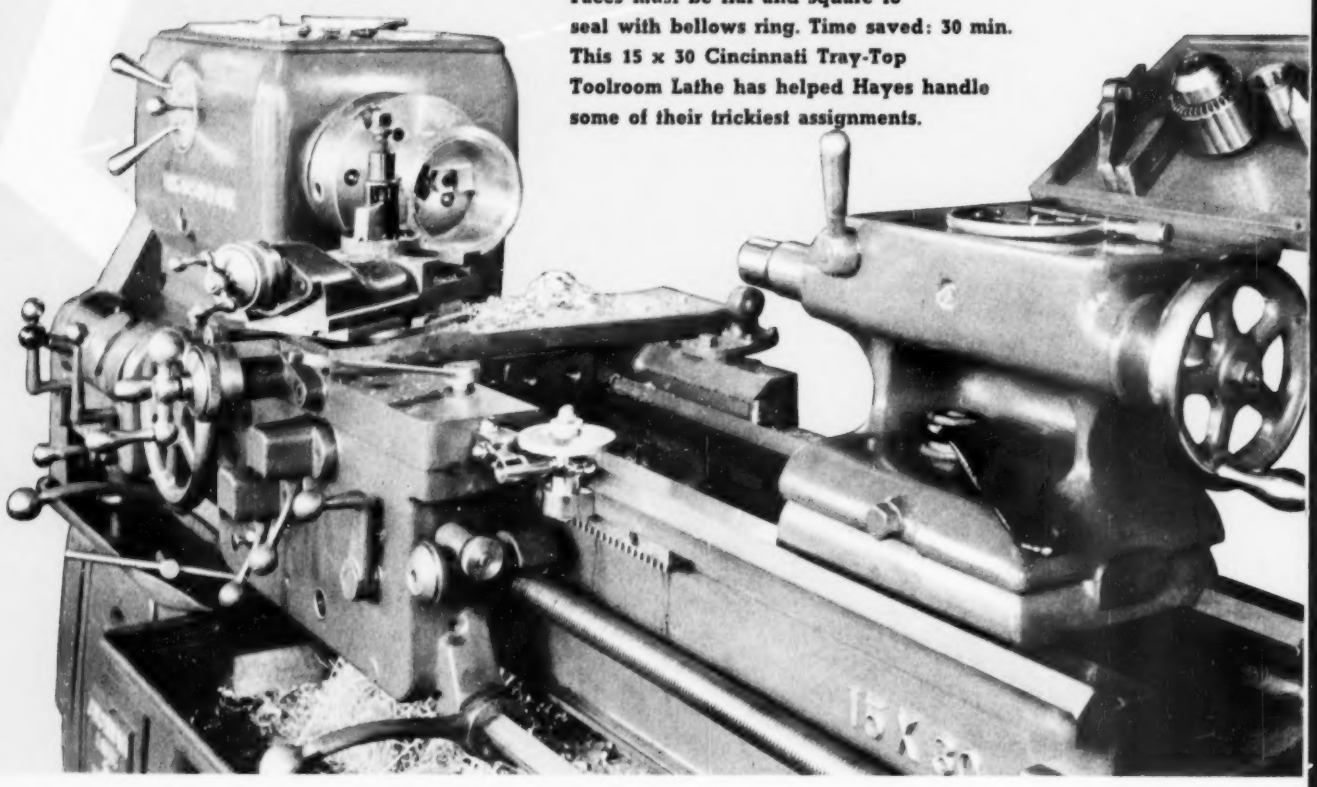
CINCINNATI LATHE & TOOL CO., CINCINNATI 9, OHIO, U. S. A.

PRECISION PLUS | AND LOW COST



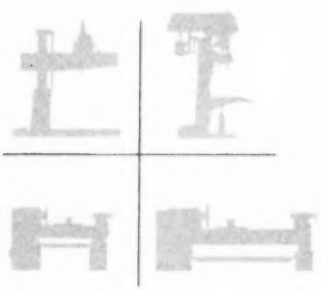
The part: bronze cap for vapor condenser, made by Hayes Scientific Appliances. Tolerances: fit to cylinder within .0003. Faces must be flat and square to seal with bellows ring. Time saved: 30 min. This 15 x 30 Cincinnati Tray-Top Toolroom Lathe has helped Hayes handle some of their trickiest assignments.

CINTILATHES: The complete, balanced line;
Tray-Top for light duty (engine, toolroom and gap bed models);
10″, 12½″, 15″, 18″ sizes; 18″ to 114″ center distances.
Model LT for medium duty (engine and gap bed models).
16″, 18″, 20″, 24″ sizes; 30″ to 264″ center distances.
Write for catalogs and name of your nearest dealer.

best buys in their class!

CINTI LATHE

CINCINNATI LATHE & TOOL CO., CINCINNATI 9, OHIO, U. S. A.



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You can't lick this stamp!

. . . It was done on a KRW Hydraulic Press . . . famous for doing all kinds of stamping work faster, better, at less cost!

Sometimes minor production operations can become major headaches. Take the case of Buffalo Meter Co., makers of water, oil and specialty meters. Stamping the serial number on the lid of each meter was formerly done on a hand press and caused no end of trouble. Sometimes the number would not register exactly on the plate; sometimes the operator applied too much pressure and the lid was sprung. It was slow, tedious, inaccurate work, hard on the operator.

Buffalo Meter solved the problem with a 25 ton KRW Motor Driven Hydraulic Press. Now one man can stamp upwards of 300 meter lids per hour — more than four times as many as before. Each number is in perfect register. And there are no more sprung lids because each stroke of the KRW press produces exactly the same amount of pressure. It's a small job, but it illustrates the value of a KRW hydraulic press for any stamping job.

Any stamping or other pressing problems in your plant? Check with KRW. We have a full line—25 to 150 ton capacities; one, two and three cylinder models; hand operated, air operated or motor driven. If you need a *special* press, we'll build it for you.

Call your local Machinery dealer; or write, wire or phone Dep't. 11 for facts, prices and delivery dates.

SINCE 1926 KRW A MARK OF DEPENDABILITY

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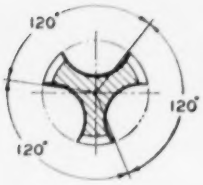
Designers and builders of Hydraulic Presses to meet any metal-working problem

BALANCED Action

ALL WINTER TAPS HAVE IT

EXACT FLUTE SPACING



is the first fundamental of Balanced Action. It is accomplished by precision indexing.

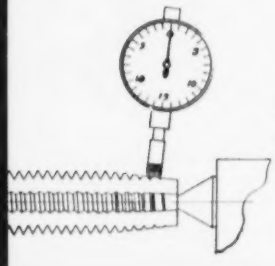
UNIFORMITY OF FLUTE CONTOURS

is essential, of course. You can't get Balanced Action without it.

PRECISION CHIP DRIVER CONTOURS

are exact to size, shape, and position —formed to give optimum performance.

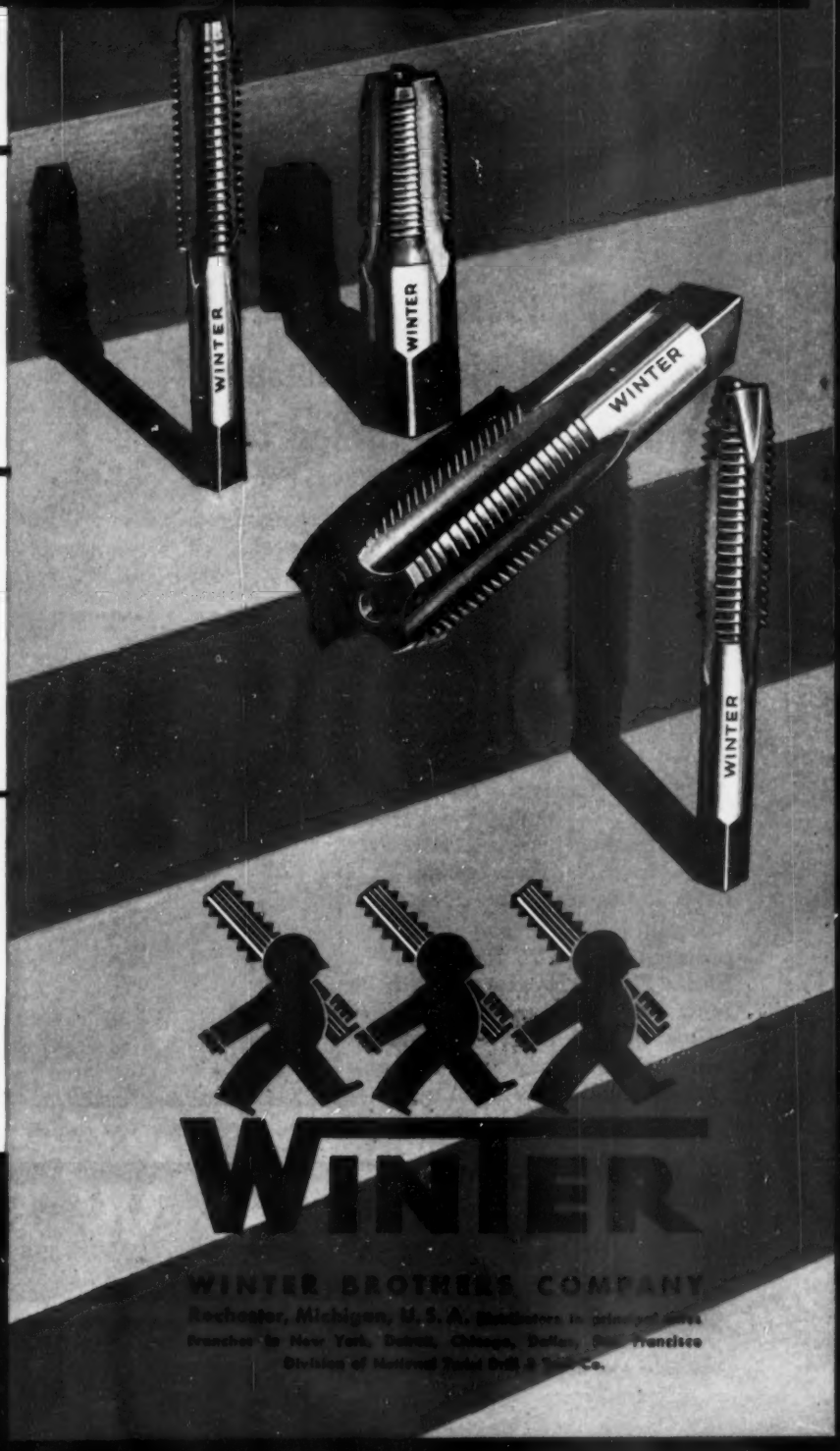
ACCURATE AND CONCENTRIC CHAMFERS



By holding shank, chamfer, and thread concentricity to very close limits, hole-accuracy is assured.

ALWAYS AT YOUR SERVICE

Your local Industrial Supply Distributor carries a complete stock of WINTER Taps.



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WITH THE BITE
TO FIT THE JOB
NATIONAL METAL SLITTING SAWS—the choice of experienced tool users—are available in a wide range of stock sizes and widths. Many special types—also slotting cutters.
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. . . For all your staple industrial needs, including NATIONAL Twist Drills, Reamers, Counterbores, Milling Cutters, End Mills, Hobs, and Special Tools

another reason why J&L turret lathes produce { *MORE CHIPS PER TOOL*
MORE PIECES PER HOUR
MORE PROFIT PER JOB

MORE COOLANT ON CUTTING TOOLS!

An outstanding, standard feature of all J & L turret lathes is the *automatic, continuous* flow of coolant *through the working face of the hexagon turret* directly onto the tools and work. Tapped holes are also provided on top of the turret for additional pipe connections. This guarantees a copious supply of coolant where and when it is needed, regardless of the position of the turret or the length of the work —a necessity for best tool life.

P.S. You should know the other J & L features. Write to Dept. 710 for Catalog.

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RAM TYPES: Bar, 1½" to 4½", Chuck, 10" to 12". , SADDLE TYPES: Bar, 2½" to 5", Chuck, 12" to 18".

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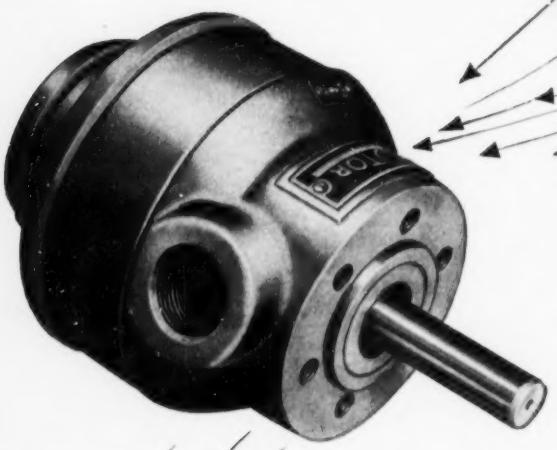
the "label" tells you it's unique



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Gerotor pumps are available in eleven sizes, some engineered for pressures up to 1200 p.s.i. continuous, 1500 p.s.i. intermittent. Deliveries range from .4 g.p.m. at 1800 r.p.m. to 40 at 1200. Plain, base or flange mountings. Specify Gerotor!

Gerotor May Corporation, Box 86, Baltimore 3, Md.

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GEROTOR
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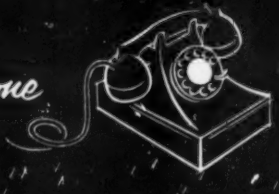
Red Shield says:

"STANDARD for tough jobs since 1881"

as near as your telephone



Call your Industrial Supply Distributor for Shield Brand Twist Drills. Specialized factory service available everywhere.

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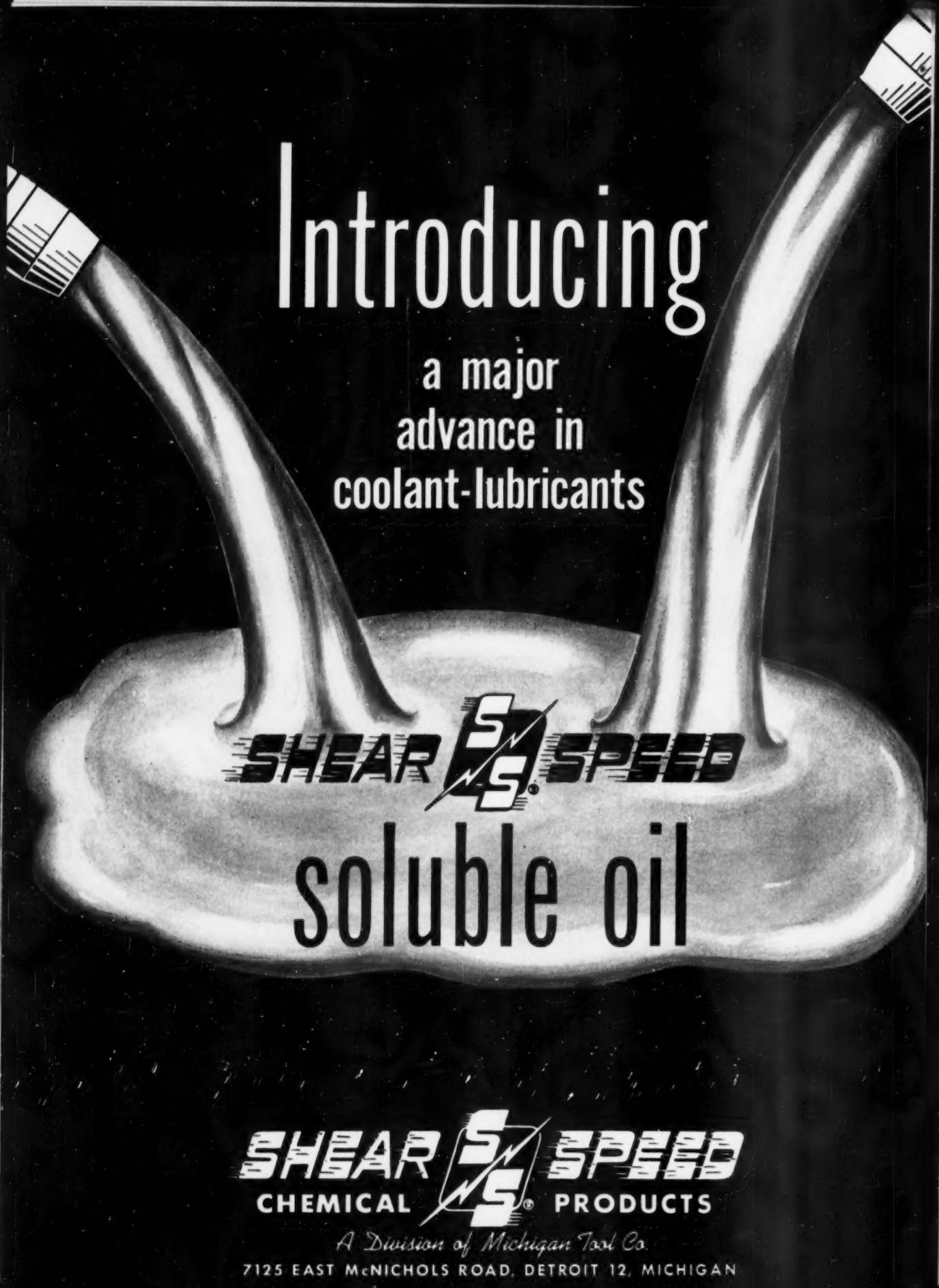
THE STANDARD LINE: *Twist Drills · Reamers · Taps · Dies · Milling Cutters · End Mills · Hobs · Counterbores · Special Tools*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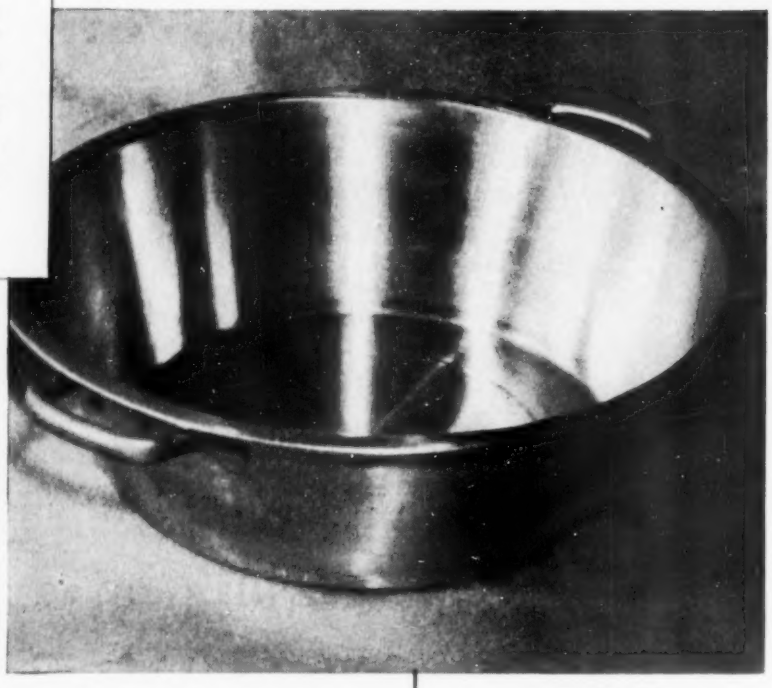
Now YOU can do MORE JOBS with just ONE cutting fluid. For the complete story on this amazing new discovery, write today for Bulletin SO-53.

SOME ANSWERS TO YOUR SHOP QUESTIONS ON

finishing straight-chromium Stainless Steels

This is another in a series of advertisements discussing the straight-chromium grades of Stainless Steel from the standpoint of fabricating performance. Other operations that will be considered in future discussions are machining, cutting and spinning.



STRAIGHT-CHROMIUM grades of Stainless Steel such as U·S·S 17 (Type 430) have finishing characteristics much like those of the nickel-bearing grades, although more or less work may be required according to the form in which the steel is used.

Type 430 Stainless develops a higher color than may be produced by the same amount of work on nickel-bearing grades; the surface resembles chrome plate when fully polished.

In some cases, severely formed or drawn surfaces may require more work than nickel-bearing grades. This is due to the directional tendencies of the metal and may require extra stock removal or polishing. Care should also be taken to overcome the galling and scoring tendencies of these grades which are inclined to "load" the surface of the polishing wheel. "Loading" may be retarded by a suitable cutting oil.

It is characteristic of Stainless Steel that heat developed during polishing may tend to disturb flatness. However, the low coefficient of thermal expansion of these straight-chromium grades minimizes this condition.

When grinding welds, the same precautions should be exercised as in handling nickel-bearing grades. These include grinding along the bead instead of across it.

If you have special problems at any point in your fabricating operations, our representatives will be glad to assist you. And you will find valuable help in our book, "Fabrication of U·S·S Stainless and Heat-Resisting Steels." For your copy, write to United States Steel Corporation, Room 2813-C, 525 William Penn Place, Pittsburgh 30, Pa.

TYPE 430
takes excellent finish on double-drawn 20-quart dishpan

The Peal Manufacturing Company, Cincinnati, Ohio is producing these 20-quart dishpans for the Quartermaster Corps from Type 430 Stainless Steel.

Sheets of .043" thickness are octagonal blanked and then drawn twice with tapered-side draws. The end flange is curled in and surface grinding follows. Handles are spot welded to the pan.

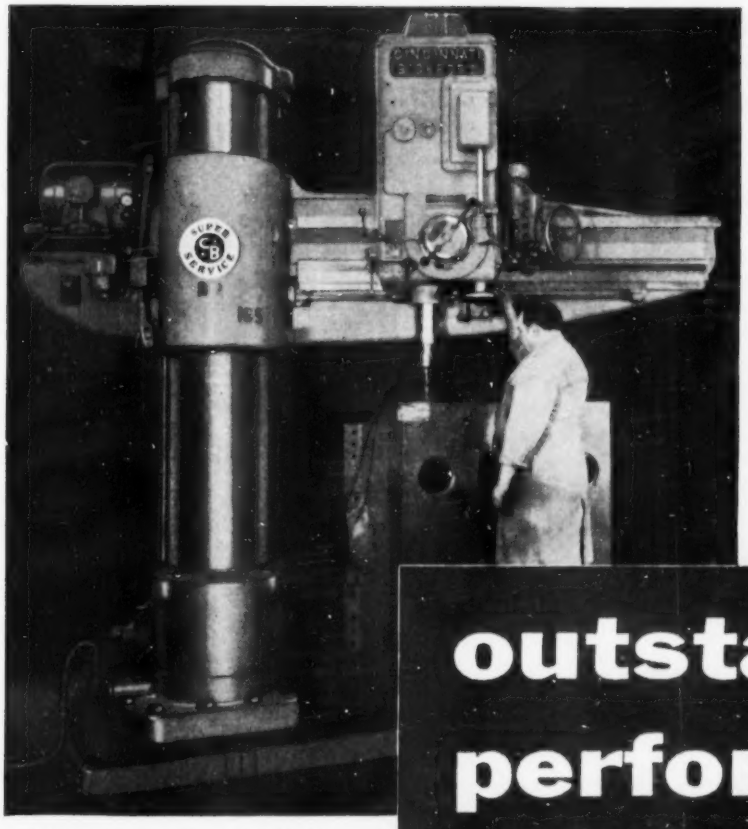
UNITED STATES STEEL CORPORATION, PITTSBURGH · AMERICAN STEEL & WIRE DIVISION, CLEVELAND · COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO
NATIONAL TUBE DIVISION, PITTSBURGH · TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA. · UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

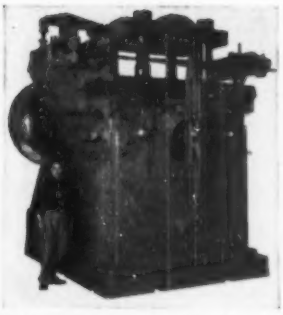
U·S·S STAINLESS STEEL

SHEETS · STRIP · PLATES · BARS · BILLETS · PIPE · TUBES · WIRE · SPECIAL SECTIONS

USS

UNITED STATES STEEL





This 350 ton Dieing Machine is produced at the Henry & Wright Division Emhart Mfg. Co., Hartford, Conn.

outstanding performance

Photos courtesy Henry & Wright Mfg. Co., Hartford, Conn.

...CUTS

CUTTING TIME

50%

This Cincinnati Bickford Super Service Radial was installed to save time, increase production and to handle new and larger work. Forty holes are being drilled in this five ton casting with diameters from 7/8" to 1-3/16". With the installation of this new Cincinnati Bickford Super Service Drill, drilling time was reduced 50%. The remarkable ease of handling of this large Radial was a major factor in the increased production.

Write for catalog R 29 for information on these productive drills.

CINCINNATI BICKFORD

RADIAL AND UPRIGHT DRILLING MACHINES

THE CINCINNATI BICKFORD TOOL CO.

Cincinnati 9, Ohio, U.S.A.

FOR THOSE TOUGH *Special* JOBS

...DEPEND ON

National Tool Co.

Years of successful experience in *special* tooling and related production problems are yours for the asking. When the job requires *special* cutting tools call in your National Tool Co. representative. He is backed by more than 46 years experience in the engineering and manufacture of *special* cutting tools. His assistance is yours, without obligation, whether you're interested in one tool or a complete tooling program.

Since 1905 **engineers and manufacturers of high-quality special cutting tools for the metal-working industry**

National Tools Cleveland

National
TOOL CO.
Cleveland 2, Ohio

MONARCH SERIES 60 LATHES

1 Totally enclosed gearbox and end gearing — for sustained accuracy

2 Automatic pressure lubrication — for long life at original efficiency

3 All anti-friction bearings — for peak power and reduced maintenance

4 Hardened, ground or shaved, wide helical gears in headstock — for precision power, easier shifting

5 American Standard Camlock Spindle Nose — for quick, rigid chuck and fixture mounting

6 Flame-Hardened- and Precision-Ground Integral Bedways — for sustained accuracy throughout the life of all four ways

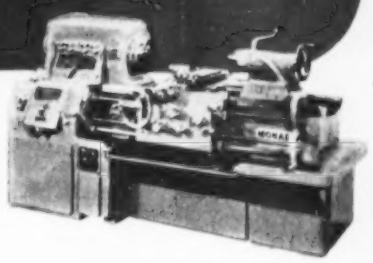
7 All critical parts made of hardened alloy steel — for long, trouble-free life

To get Utmost Value OUT OF YOUR LATHE— Buy Series 60 Value BUILT INTO your Lathe

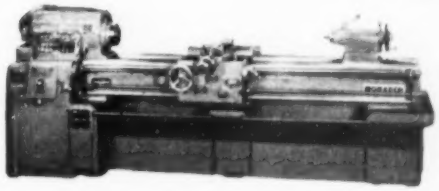
Isn't it logical? Aren't the costs and quality of your products directly affected by the sustained accuracy, speed, versatility and dependability of your turning equipment?

So look over the Monarch Series 60 product features listed above (bearing in mind that almost all of them were Monarch pioneered). Check the extra strength, weight and power of the machines, making them, within their rated capacity, fully capable of sustained heavy production. Then look over the wide choice of accessory equipment that lends such versatility to the basic Engine and Toolmaker's models. This includes (with Monarch only!) choice of three types of Tracer Controls — including the Air-Gage Tracer which, with further addition of the Auto Cycle Unit, gives you a fully automatic cycle high production unit.

For utmost lathe value for toolroom, production line or maintenance shop — look into the Monarch Series 60! Let us send our Booklet No. 1113 with complete information. Just write! . . . . *The Monarch Machine Tool Company, Sidney, Ohio.*



Monarch Series 60 Engine Lathe. Series 60 models are furnished in 13", 16", 20" and plus-swings.

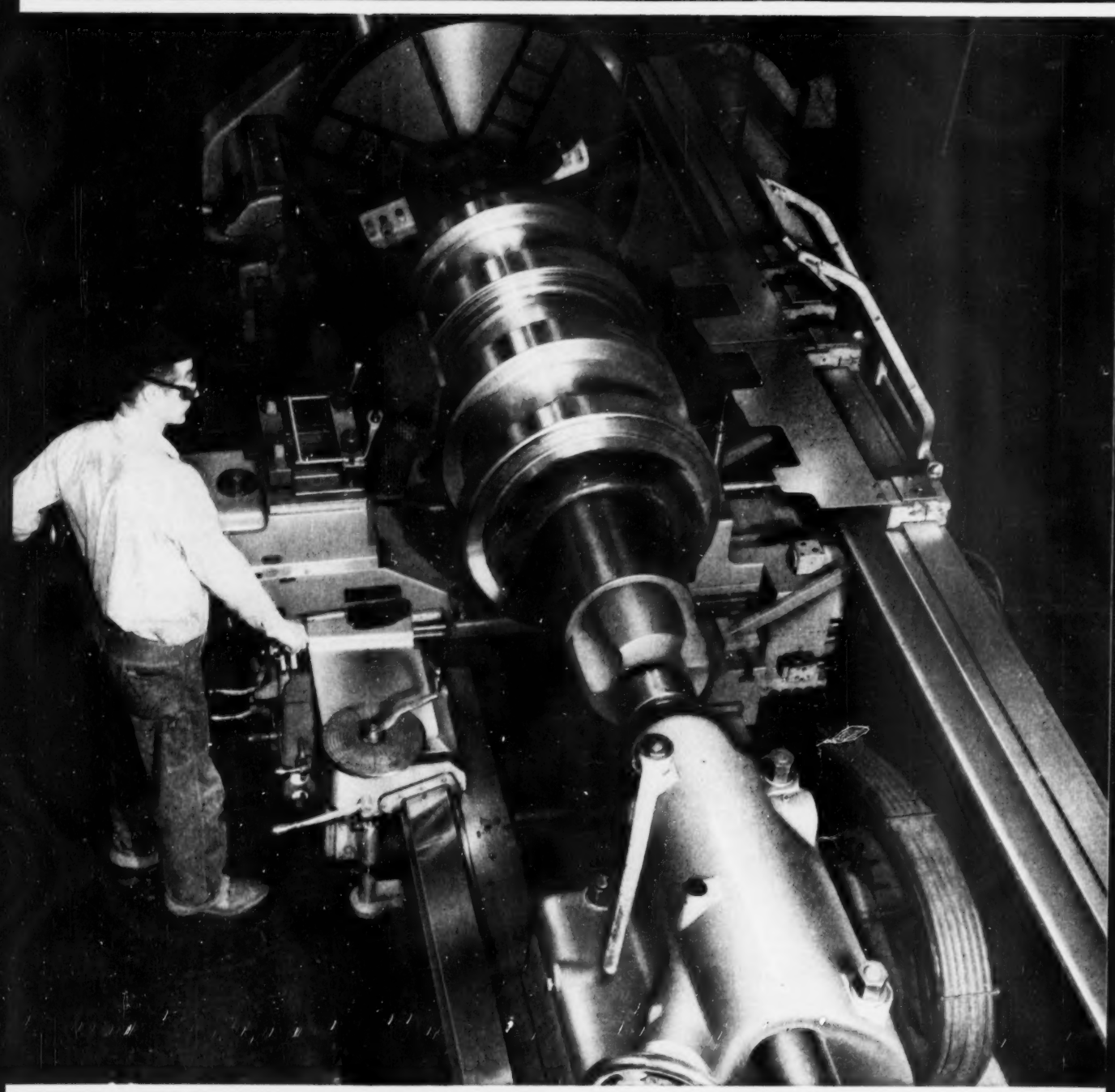


Monarch Series 60 Toolmaker's Lathe. All Series 60 Models are furnished in a wide variety of bed lengths.

Monarch
TURNING MACHINES
ACCURACY • ECONOMY • LONG LIFE

FOR A GOOD TURN FASTER TURN TO MONARCH

LeBlond Lathe eases cost squeeze ...on rolls that

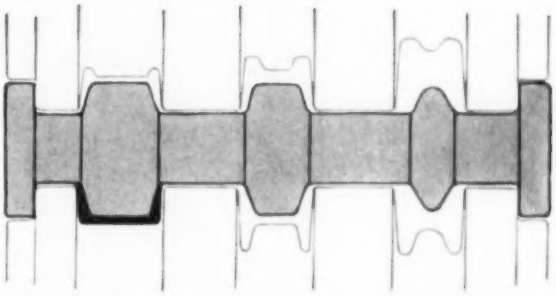


Shape rolls of 30½" dia. x 51" body cast alloy semi-steel are turned to .005" tolerance in 94 hours on this 50" LeBlond Roll Contouring Lathe. Set-up time—½ hour. Clamped-on and brazed-on carbide tips are used at 48 rpm, .040 ipr feed. Conventional roll lathe took 245 hours for the same job.

squeeze channels from ingots

U. S. Steel Lops 151 Hours Off 245-Hour Roll-Turning Job.

Every day at U. S. Steel's Clairton Works, Clairton, Pa., miles of "hotter-than-orange" steel are squeezed through the passes of rolls like these for reduction, elongation, shaping. They come out as finished structural steel for the "jungle-gym" frameworks of modern buildings. Turning these costly shape rolls with their steep-angle contours used to keep a lathe running *245 hours on a single roll* at U. S. Steel. Tool life was short and the job required highly skilled operators. Stepped-up schedules called for a new solution to this tough-nut production problem.



Typical roughing rolls for 8" channel

A LeBlond 50" Roll Contouring Lathe, purchased through Pittsburgh Distributor Barney Machinery Co., immediately slashed the 245-hour turning time by an astonishing 61.7%. Now U. S. Steel *saves 151 hours on each roll*—more than enough time to turn out two more just like it. Tool life is greatly improved and less experienced operators can handle the work.

The 50" LeBlond Roll Contouring Lathe is equipped with two-directional hydraulic tracing. A single valve automatically controls two hydraulic motors for cross and length feed. A stylus follows a flat template mounted at the back of the lathe. Feed and speed can be varied during a cut without leaving a tool mark. For roughing, hydraulic cross feed can be by-passed and length feed used separately. This enables operator to cross feed manually, use template as length stop. Mechanical power rapid traverse to carriage and cross slide is also provided. All controls are located conveniently at the apron. The lathe uses a 40 constant horsepower DC motor, has nine speed changes in the headstock, delivers infinitely variable speeds from 1 to 165 rpm.

Whether your turning jobs involve specialized production like roll-turning, or call for high precision, high production—investigate LeBlond's complete line of 76 lathe models. LeBlond engineers will help you get a better turning job, faster. Write today or see your nearby LeBlond Distributor.

Ask for complete information on Roll Contouring Lathes in 25", 32", 40" and 50" sizes.

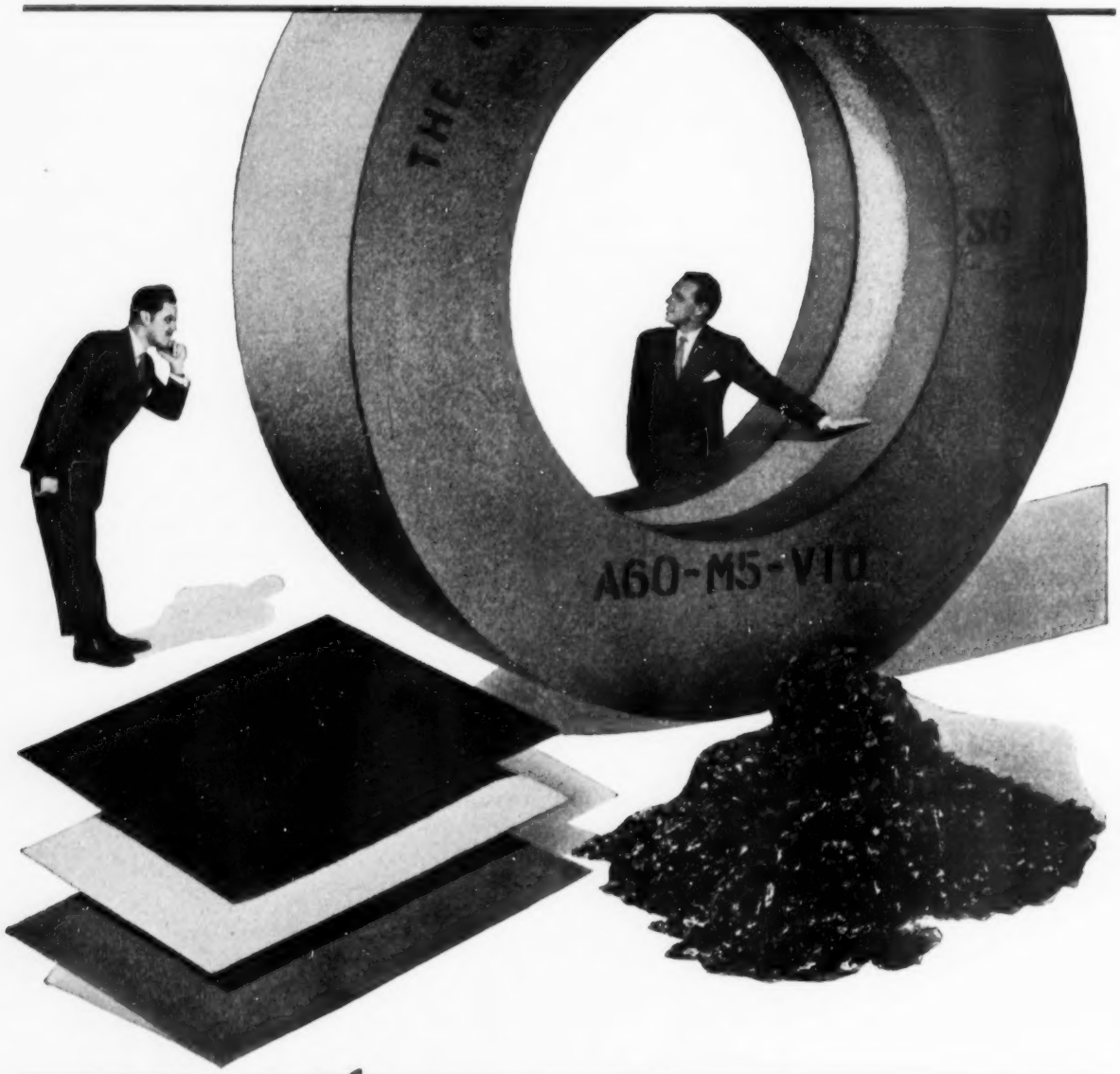
Turned faster by

LeBLOND of Cincinnati

THE R. K. LEBLOND MACHINE TOOL COMPANY, CINCINNATI 8, OHIO

WORLD'S LARGEST BUILDER OF A COMPLETE LINE OF LATHES • *FOR MORE THAN 66 YEARS*

What's BEST FOR



CARBO

TRADE

"Carborundum" is a registered trademark which indicates manufacture by The Carborundum Company, Niagara Falls, New York

YOU is BEST for us!

You get UNBIASED COUNSEL based on all abrasive methods

Your business, in mass production of parts or finished assemblies, is the problem of generating close tolerance sizes, of producing high surface finishes, of removing stock. The business of CARBORUNDUM is the exclusive ability to recommend and furnish you the specific type of abrasive product which will give you highest quality at lowest cost, on every operation you perform.

Take surfacing, for instance. There are at least 11 different methods of grinding plane or flat surfaces with abrasives. Is your present method the best—the most economical? How can you be sure? Ask CARBORUNDUM . . . for CARBORUNDUM alone has a complete branded line of grinding wheels *and* coated abrasives *and* tumbling and polishing grains. Only CARBORUNDUM can recommend without bias, on the sole basis of what's best for you.

Or perhaps you manufacture table glassware. You can engrave the decorations with a grinding wheel—or you can etch them with high-velocity abrasive grain. You can finish the edges with abrasive belts, or with a grinding wheel. Whatever your method, CARBORUNDUM alone can supply *all* the abrasives you need with *one-source control* of quality . . . quality that's constant, identical, dependable—thus economical.

Several ways to do one operation? Call in CARBORUNDUM. Several processes on one part? Call in CARBORUNDUM. Either way, you win.

Call your CARBORUNDUM *Salesman or Distributor* today!

He's your best bet for complete stocks, prompt delivery . . . and best of all, experienced counsel on *every* new development in the *entire* field of abrasives. He's in the yellow pages under "Abrasives" or "Grinding Wheels." Phone him today—it's to your profit!

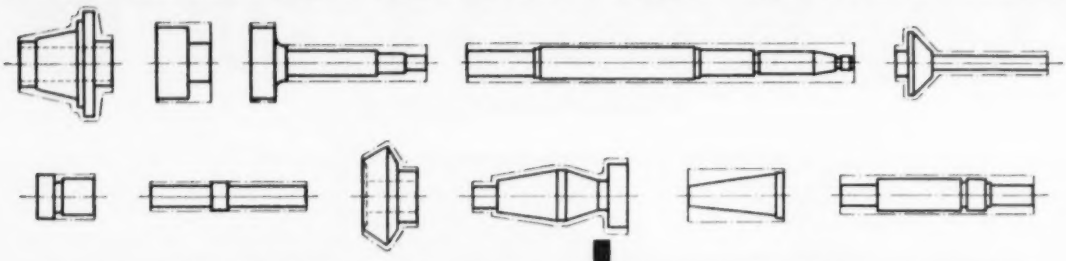
Ready now—your free copy of the new big COATED ABRASIVE SELECTOR catalog . . . containing detailed recommendations for both machine and hand sanding operations on tough and soft metals, glass, plastic, wood. Phone for it today

RUNDUM

MARK

. . . the ONLY source for EVERY abrasive product you need

IF YOU HAVE TO PRODUCE PIECES SUCH AS THESE



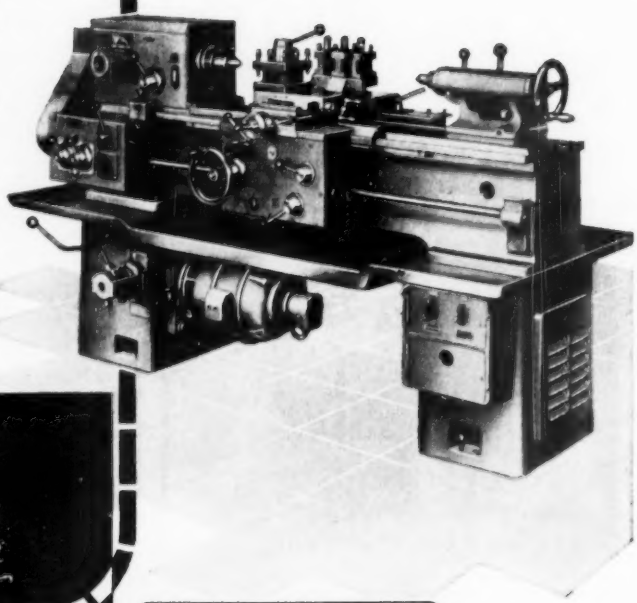
THE PZ 165 IS THE PRODUCTION LATHE *FOR YOU!*

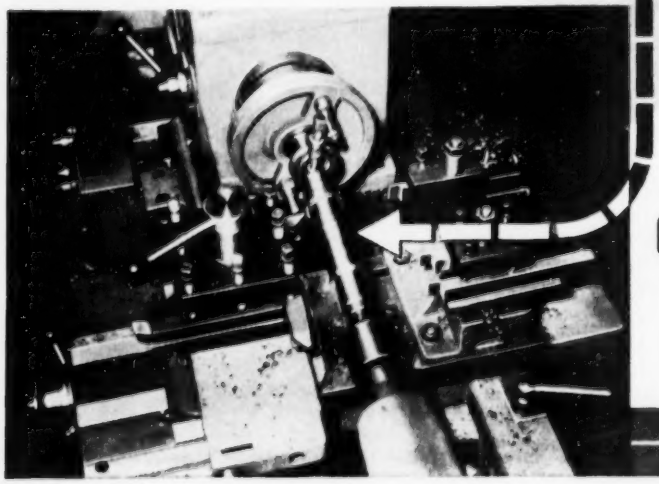
Regardless of whether it is 10 or 50 or 250 pieces, the PZ 165 production lathe is the machine for the job!

The PZ 165 is especially suited for center turning, as for example, rough- and finish-turning of shafts down to gauge size

Quick Change! The greatest feature of this lathe is the ease and rapidity with which it can be set-up for each new job.

Everything about this lathe is designed to help you attain quantity production! Speeds of 120/1500 and 190/2400 RPM – electric brake for stopping the spindle lightning fast – automatic disengagement of the longitudinal and cross feed to .0004" – 5 HP electric motor.





WEISSER HEILBRONN

DATA:	
Height of centers	6½"
Swing over bedways	13⅜"
Swing over cross slide	6½"
Distance between centers	20"/40"

WEISSER HEILBRONN

Always Best! Always Weisser!

Representatives and Service:

USA: Guthery Machine Tool Corp., 130 West 42nd Street, New York 36, N. Y. Telephone CHickering 4-2820.

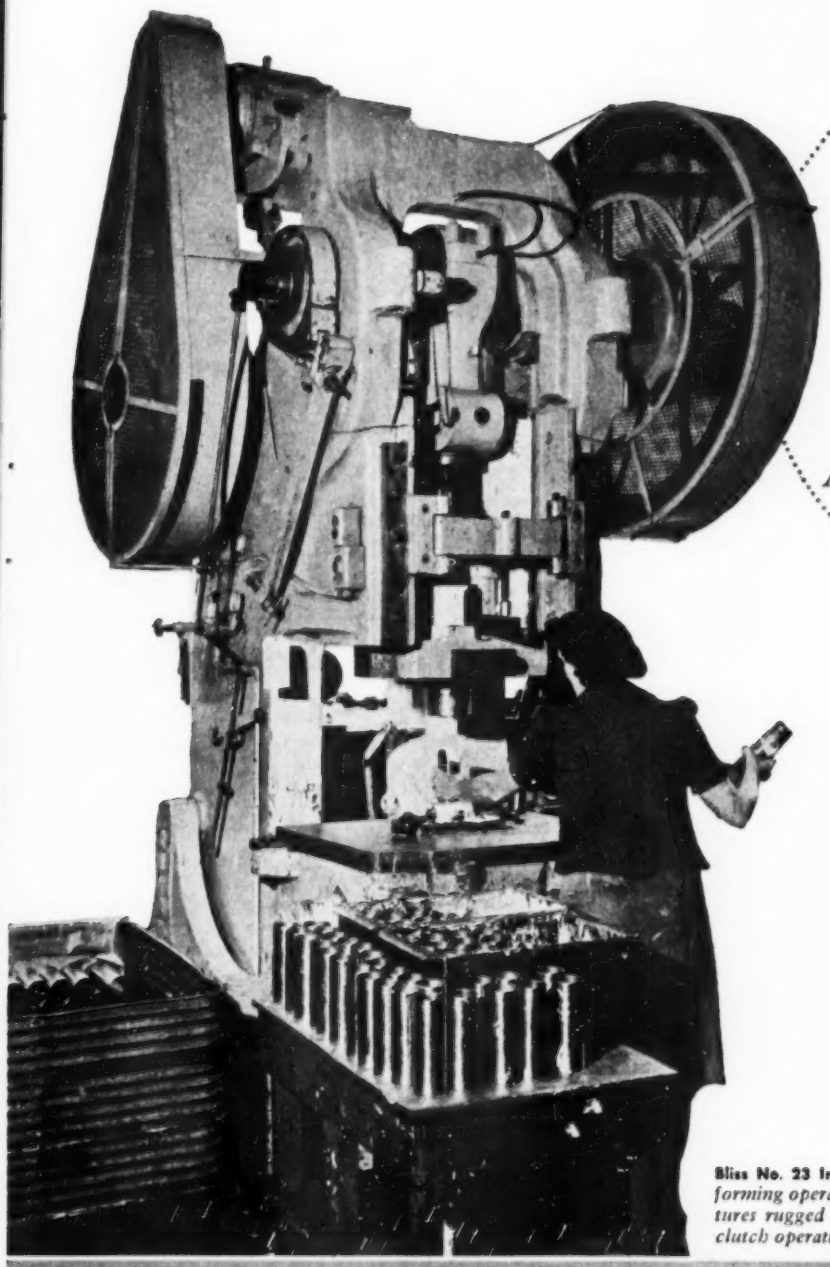
Canada: Transocean Machine Company Inc., 267 Dunbar Avenue, Montreal 16, P.Q. Telephone: REgent 3-5373

EUGEN WEISSER & CO. KG.

HEILBRONN / NECKAR (Germany)

Machine Tool Manufacturer · Salz Strasse 79/83 and 128/130

THE TREND IS TO MORE STAMPINGS WITH BLISS PRESSES



Not a dime spent on maintenance in 8 years in Snyder's ALL-BLISS press shop

Snyder Manufacturing Co. of Philadelphia discarded all their old presses and equipped their shop 100% with Bliss inclinable and straight-side presses back in 1945.

That was a significant decision for the world's largest manufacturer of television and auto radio aerials.

Results? In the eight years that Snyder's press shop has been all-Bliss, they have not had to spend a *single* dime on maintenance of the 25 Bliss presses.

And, as the press room accident rate dropped to zero with the Bliss presses, operators found they could run the presses faster.

The Snyder story is not unique. Bliss is the dominant factor in press room after press room. For a complete press room or a single press for a given job, you'll find it's best to call in Bliss.

Bliss No. 23 Inclinable Press, *used by Snyder for forming operations on television accessories, features rugged construction, fast and dependable clutch operation.*

E. W. BLISS COMPANY, CANTON, OHIO

U. S. plants at Canton, Toledo, Salem, Ohio; Hastings, Michigan

E. W. Bliss (England) Ltd., Derby, England

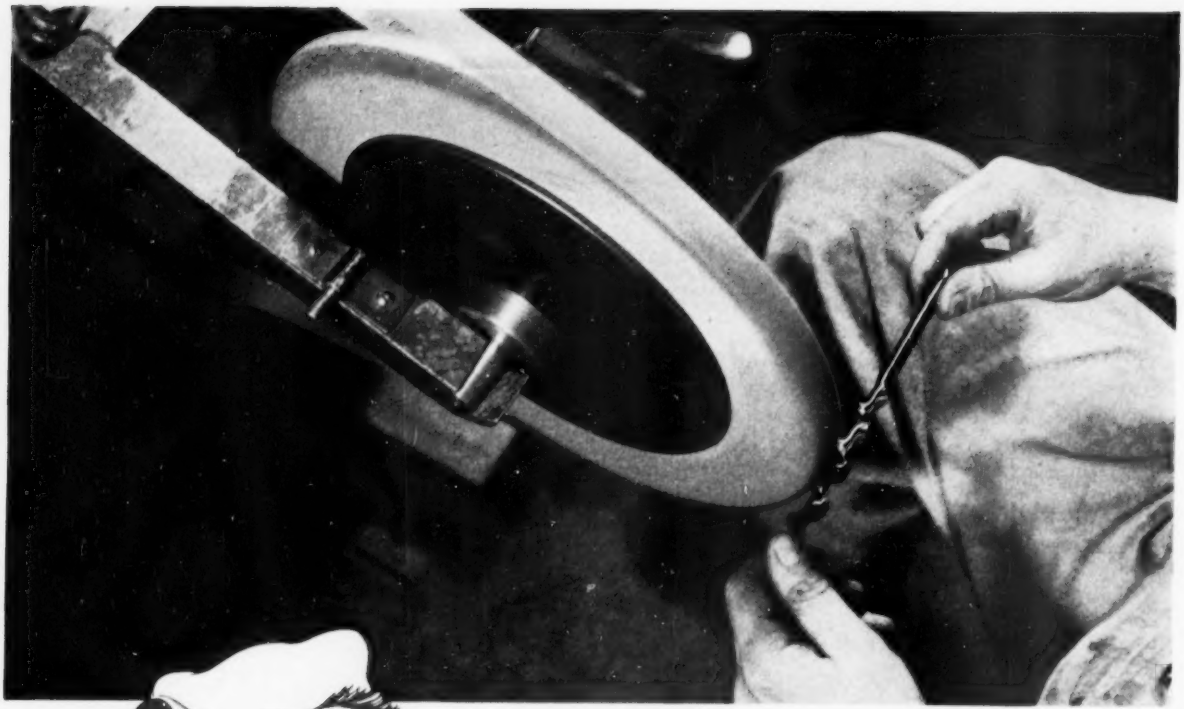
E. W. Bliss Company (Paris), St. Ouen sur Seine, France

PRESSES, ROLLING MILLS, SPECIAL MACHINERY

Branch offices in Chicago, Cleveland, Dayton, Detroit, Indianapolis, New Haven, New York, Philadelphia, Rochester, Toledo; and Toronto, Canada. West Coast Representatives: Moore Machinery Company, Los Angeles and San Francisco; Star Machinery Company, Seattle. Other Bliss representatives throughout the world.

BLISS

ON YOUR PRESS IS MORE THAN A NAME...IT'S A GUARANTEE!



"IF IT'S POLISHING, LET ME DO THE EXPERIMENTING" SAYS POLISHER PETE

You may hit it in one — then again you may make many tries for the most profitable polishing method, get only a mediocre result. Consider the many variables in this polishing game — here are some:

2 Types of electric-furnace abrasive grain —
19 Sizes of abrasive grain —
9 Types of belt —

Over 15 types of contact wheels and that's only part of it — right there, are over thousands of possible combinations. Why waste good production time on hit-or-miss research when Polisher Pete has already gone over the ground and has your answer ready for you?

Polisher Pete symbolizes the BEHR-MANNING® Engineering Application Department, and the staff of BEHR-MANNING Abrasive Engineers, with this polishing data right at their finger tips, is all set to cooperate. Even if you *know* you are getting best results, why not confirm it. Call in your local BEHR-MANNING Field Engineer and make a double-check.

For some pretty solid facts on polishing, write for the booklet, "How Polisher Pete Put Economy in Polishing." Behr-Manning Corp., Troy, N. Y., Dept. AM-7.

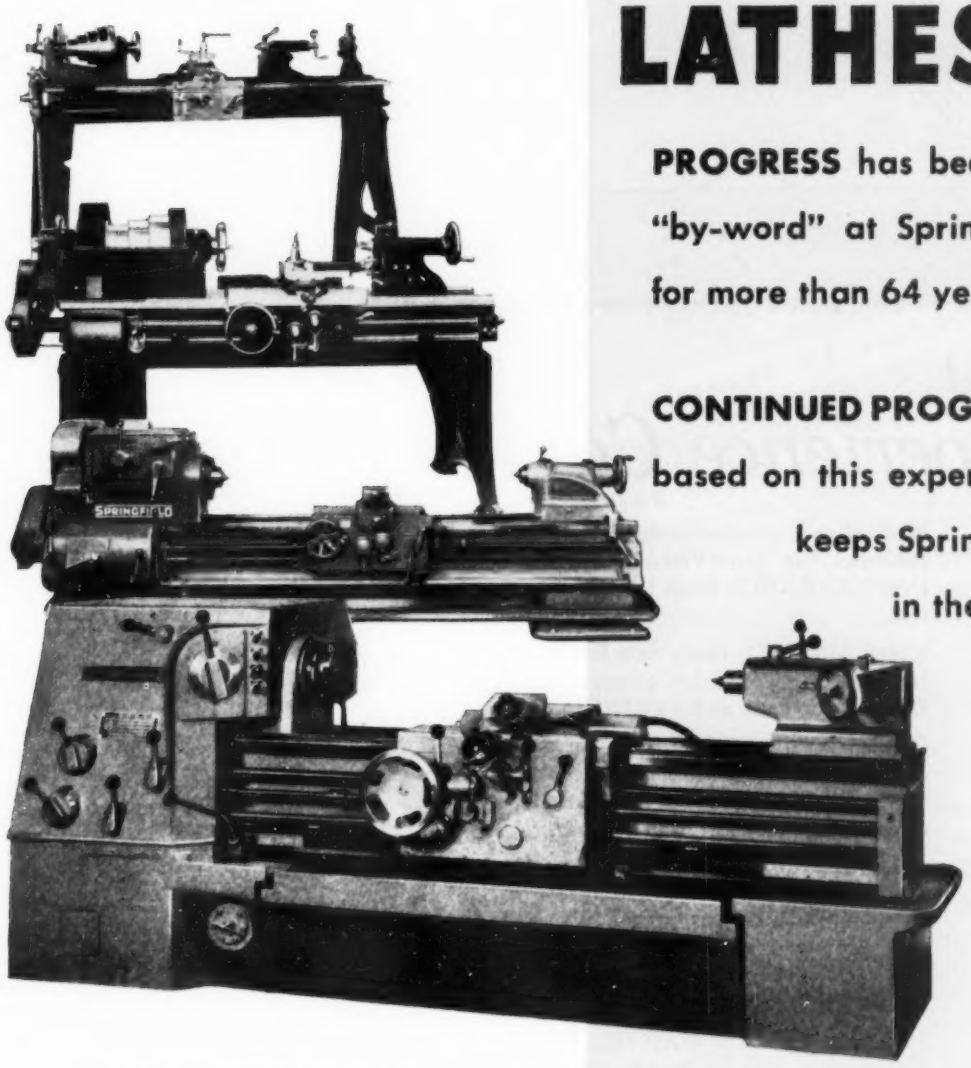
For Export: Norton Behr-Manning Overseas Inc., New Rochelle, N. Y., U. S. A.
In Canada: Behr-Manning (Canada) Ltd., Brantford.

BEHR-MANNING
CORPORATION
division of NORTON Company

▲ COATED ABRASIVES
▲ SHARPENING STONES
▲ PRESSURE-SENSITIVE TAPES

SPRINGFIELD

LATHES

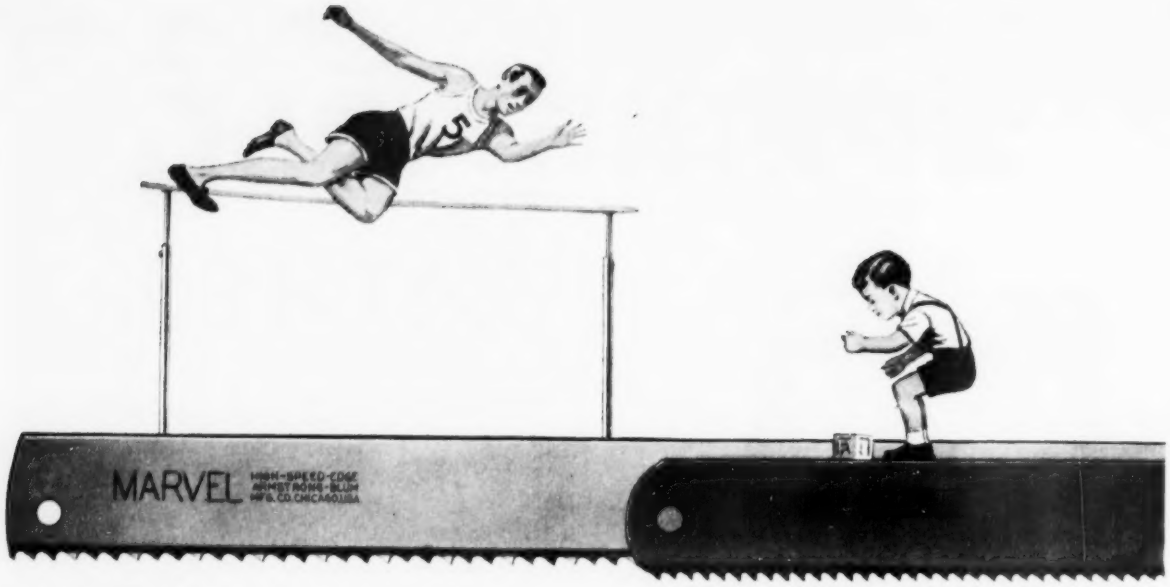


PROGRESS has been the "by-word" at Springfield for more than 64 years.

CONTINUED PROGRESS, based on this experience, keeps Springfield in the lead.

BUY SPRINGFIELD for the latest in design, construction and performance
BUY SPRINGFIELD . . . . . for accuracy, speed, stamina, versatility

THE SPRINGFIELD MACHINE TOOL COMPANY
SPRINGFIELD, OHIO, U. S. A.
GENERAL DISTRIBUTORS: BRYANT MACHINERY & ENGINEERING COMPANY, 640 W. WASHINGTON BLVD., CHICAGO 6
EXCLUSIVE REPRESENTATIVES IN ALL PRINCIPAL CITIES



. . . *but*
Experience Cannot be Copied

More than a quarter-century ago MARVEL invented and basically patented the MARVEL High-Speed-Edge Hack Saw Blade—the UNBREAKABLE blade that increased hack sawing efficiency many-fold.

Every MARVEL Hack Saw Blade ever sold has been of that basic welded high-speed-edge construction, with constant improvements from year to year, as EXPERIENCE augmented the "know-how" . . .

MARVEL is not "tied" to any single source of steel supply, and has always used the best high speed steels that became available from time to time as metallurgy progressed. When-as-and-if finer steels are developed—and are proven commercially practical for welded-edge hack saw blades—MARVEL will use them, regardless of cost or source . . .

There is only one genuine MARVEL High-Speed-Edge! All other "composite" or "welded-edge" hack saw blades are merely flattering attempts to imitate — without the "know-how" of MARVEL EXPERIENCE . . .

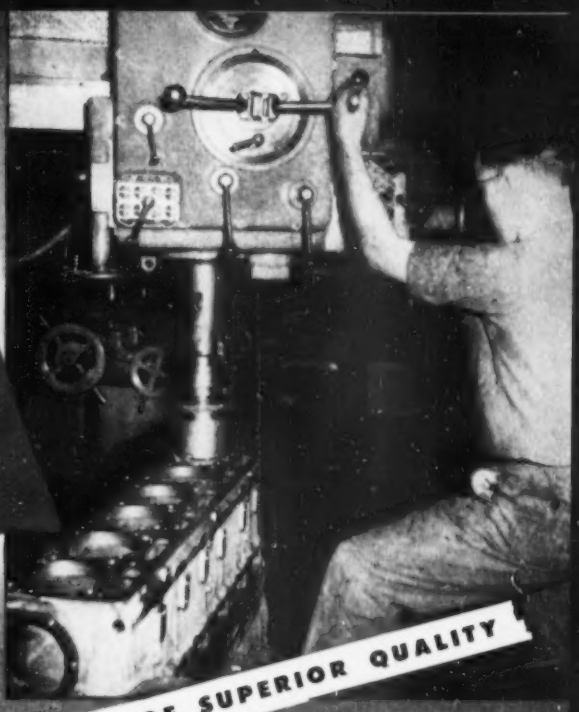
Insist upon *genuine* MARVEL High-Speed-Edge when buying hack saw blades—and be SAFE, for you can depend upon MARVEL. They have been "tested", "pre-tested", and "re-tested" by thousands of users for more than a quarter-century!

MARVEL *Metal Cutting* SAWS

Better Machines–Better Blades

ARMSTRONG-BLUM MFG. CO. • 5700 Bloomingdale Ave. • Chicago 39, U. S. A.

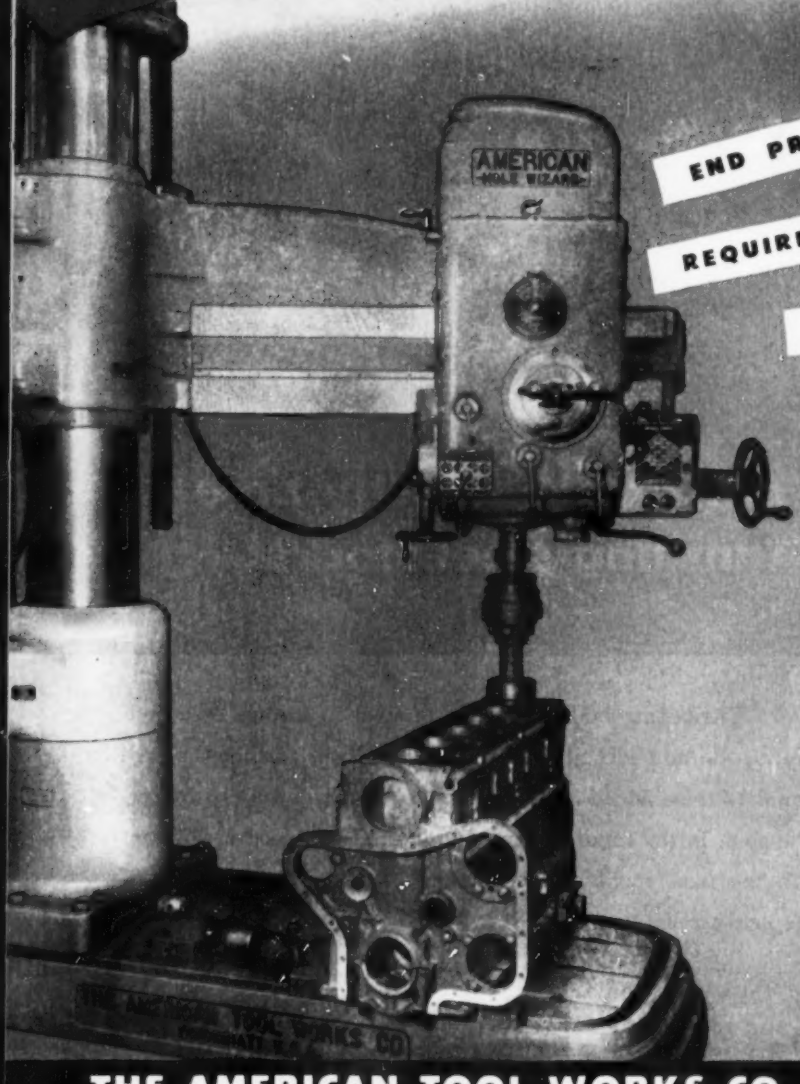
The 2 are inseparable—



END PRODUCTS OF SUPERIOR QUALITY

REQUIRE SUPER QUALITY EQUIPMENT

TO PRODUCE THEM . . .



For six years this "AMERICAN" Hole Wizard Radial has been counterboring "Cummins" Diesel Engine Blocks and holding the required depth tolerance of .001″ in the 6.125″ counterbores. Furthermore, the operator testifies to the fact that the machine is convenient and easy to operate and maintenance has been negligible.

The quality of "Cummins" products is universally recognized. We are proud indeed that so many "AMERICAN" Lathes and Radial Drills contribute to it.

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

WHY IT PAYS TO BUY STEEL FROM WAREHOUSE

You don't waste costly time rehandling steel stocks!

- LOWER INVENTORY COSTS
- LOWER SPACE COSTS
- LOWER TIME COSTS
- LOWER CAPITAL INVESTMENT
- FASTER PRODUCTION
- FEWER INVENTORY LOSSES

UNLOADING and distributing bulk shipments of steel to storage area and then to production and job sites demand added time, manpower and equipment. Eliminate these added costs by letting U. S. Steel Supply deliver your steel to the spot, in the condition and at the time you need it. Fifteen warehouses with the most modern steel handling and delivery equipment assure your complete satisfaction.

U. S. STEEL SUPPLY

DIVISION

General Office
208 So. La Salle St., Chicago 4, Ill.

USS

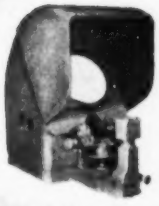
Warehouses and Sales Offices Coast to Coast

UNITED STATES STEEL

11 MODELS

3 SCREEN SIZES

Pedestal Type
14" Diam. Screen



Bench Type
14" Diam. Screen
4 Models

Bench Type
5¾" x 7¾" Screen
3 Models

Unsurpassed Inspection Versatility

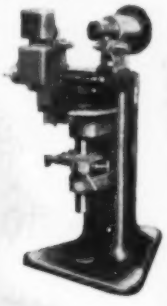
JONES & LAMSON OPTICAL COMPARATORS

The Essence of Quality Control

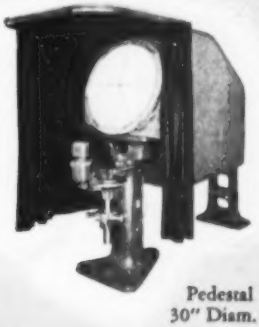
Jones & Lamson Optical Comparators are designed and built like rugged machine tools to withstand vibration and hard use. Yet they have the built-in accuracy to satisfy the most exacting laboratory standards.

- **They meet** the requirements of toolroom, laboratory and production inspection.
- **They precisely measure** height, depth, lead or spacing, as well as angles to degrees and minutes. They will measure to .0001".
- **They compare** intricately contoured parts with a master outline—and measure the amount of error.
- **They are convenient** to operate, easy to set up and read direct—*without computation.*
- **They operate** under normal lighting conditions. *No darkroom is needed.*
- **They will photograph** the enlarged shadow and record its relationship to a master chart.
- **Several persons** may study the shadow *at the same time.*
- **They will inspect** and measure surface contours, as well as profiles of objects such as type faces, stamping dies, punches, worn tools, etc.

Vertical Type
14" Diam. Screen



Direct
Projection
Type



Pedestal Type
30" Diam. Screen

P.S. A complete line of STANDARD CHARTS and FIXTURES is maintained by us.

JONES & LAMSON *Machine Tool Craftsmen Since 1835*

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502 Clinton St., Springfield, Vt., U.S.A.

J&L COMPARATOR DIV.
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Please send Comparator Catalog No. 402.

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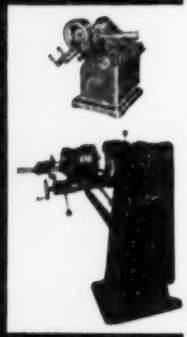
Keep Your on the OLIVER Line — Cost Cutting Production Boosting MACHINE TOOLS

OLIVER DRILL POINTERS

Properly machine ground drills, give better performance. OLIVER Drill Pointers, with each lip doing equal work, give balanced cuts—more accuracy—more perfect holes—more efficiency—longer drill life.

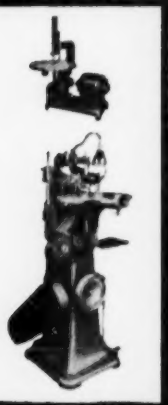


As Illustrated:

No. 21 Oliver Bench Drill Grinder. Hand operated for Drills No. 57 to ½".

No. 510 For Drills ¼" to 3"—2-3-4 flute.

OLIVER DIE MAKING MACHINES



Efficient, speedy and accurate — effecting great savings in time and costs. Skilled labor is not required for sawing, filing and lapping operations.

Available in 5 Models.

Bench Model S-1 (Illustrated) — Single Speed Die Maker for use on Tool Steel up to 1" Thick.

Heavy Duty Model (Illustrated) — 6 speeds, works in metal up to 3" thick, has variable strokes to 5" with hydraulic feed.

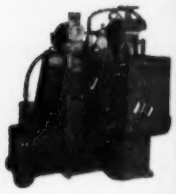
OLIVER ACE UNIVERSAL TOOL & CUTTER GRINDERS

Keep your most difficult cutters sharp with Oliver ACES. They excel on high speed and Tungsten-Carbide work. Direct reading for clearances reduces fatigue — eases operators' jobs.

The ACE excels for grinding face mills up to 15"; also, slab mills • slitting saws • all types cutters and reamers.

2 Models: Heavy Duty (Illustrated) and Standard.

OLIVER 20" TEMPLATE TOOL BIT GRINDER



Efficiently powered by a 3 h.p. motor, this OLIVER Machine grinds on the periphery of a 20" wheel. Capacity: tools up to 1½" wide x 1¾" high from 0° to 20° clearance. The OLIVER is developed for production sharpening of single point Tungsten Carbide and high speed tools—offers increased production, lower tool costs and savings in man hours. Extremely fine finish assured.

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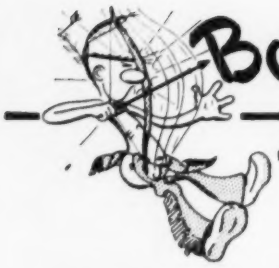

Backlash

EXTRACTS FROM CURRENT LETTERS TO THE EDITORS

Who Picks Whom?

Alfred M Cooper's interesting and helpful article, "How Will You Pick Your Assistant?" (*AM*—Aug 18 '52, p116), prompts me to ask: "Do we ever?" A long experience of appointing assistants, from time to time, would seem to indicate that although we might not be aware of it, our assistants really pick us. This applies even in the case of advertised vacancies when the applicants and future assistants are quite unknown to us prior to an interview. If we proceed to appointment on the sane and logical lines of ability and suitability, we really fall for them, we don't pick them. They are displaying their 'goods' to the best advantage in order to sell us them, and we who flatter ourselves that we are selecting or picking an assistant are really appointing the one who has registered the greatest impact on our senses at the interview, the one who literally set out to compel us to appoint him.

Appointing from within the organization does not differ greatly in essentials from that of the advertised job and interview procedure. We may take a fancy to a given man in the shops and may even have been looking them over with a view to appointing an assistant, but I doubt if we picked one.

If we think back over steps which led us to make an apppointment we will probably find that we had little or no choice in the matter. We will probably find that the person appointed literally compelled himself

GRINETICS

BY D G SMITH

CYANIDE HARDENING

LOCK WASHER

POLYGON

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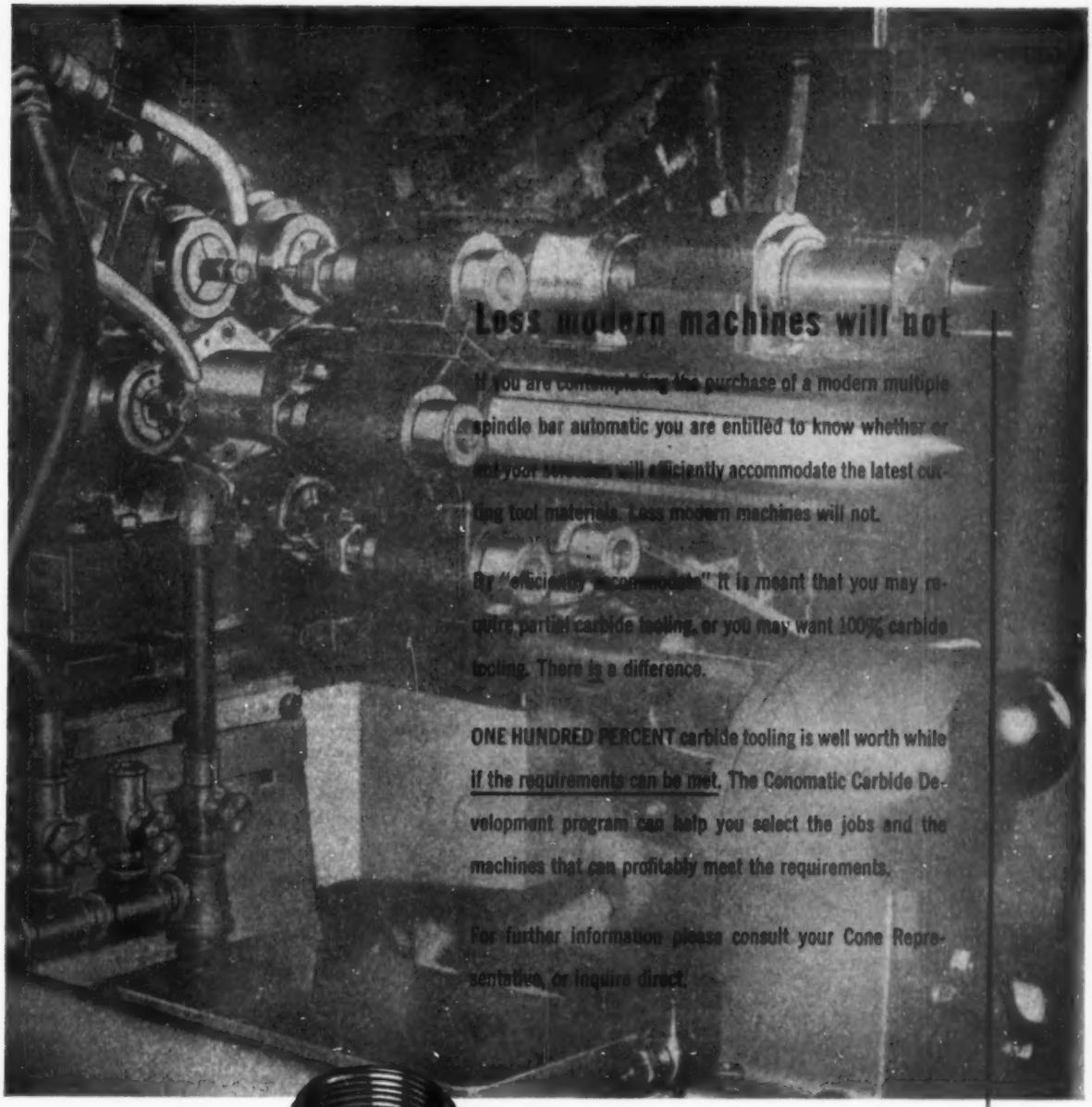


Less modern machines will not

If you are contemplating the purchase of a modern multiple spindle bar automatic you are entitled to know whether or not your selection will efficiently accommodate the latest cutting tool materials. Less modern machines will not.

By "efficiently accommodate" it is meant that you may require partial carbide tooling, or you may want 100% carbide tooling. There is a difference.

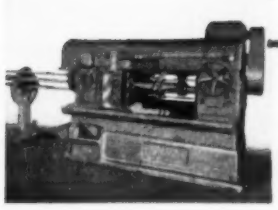
ONE HUNDRED PERCENT carbide tooling is well worth while if the requirements can be met. The Conomatic Carbide Development program can help you select the jobs and the machines that can profitably meet the requirements.

For further information please consult your Cone Representative, or inquire direct.

MATERIAL—1040 STEEL

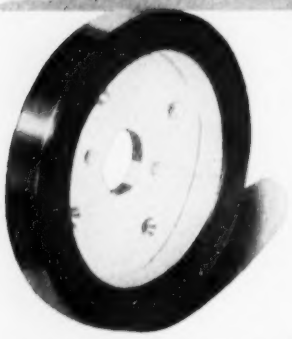
	HSS	CARBIDE
Cycle Time	*	36 secs.
Work Spindle Speed	*	670 R.P.M. at 160 S.F.
Tool Wear	*	2000 pcs. per grind

*Hot rolled material prevents fair comparison



Conomatic} CONE AUTOMATIC MACHINE COMPANY, INC. WINDSOR, VT., U.S.A.

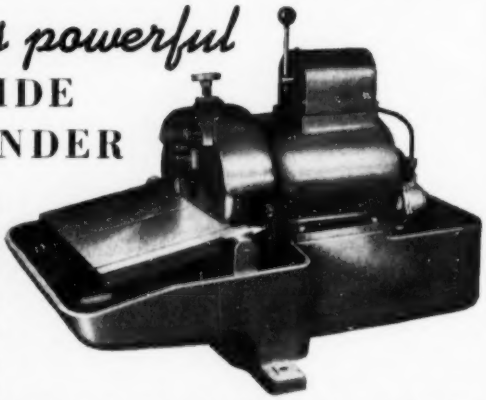
Grind More Carbide *per Carat of Diamonds*



...with STEEL-BONDED DIAMOND WHEELS

Wickman-Neven Steel-Bonded Diamond Wheels stretch wheel life—lower your carbide grinding costs because they're practically indestructible. They can't be damaged even by plunging sharp-pointed tools into them. Diamonds stay in place until worn to give more cuts per carat. These wheels also give up to 300% longer carbide tool service by producing a strong, uniform cutting edge that resists breakdown.

...and this powerful CARBIDE BENCH GRINDER



Ideal for all off-hand carbide tool grinding, the Wickman Model GF-2A is heavily built for years of service even by unskilled help. The 1 HP direct-drive motor is quickly reversed, and the wheel guard swivels for right- or left-hand grinding. A built-in coolant pump delivers 12 GPH; primer and strainer are also included. This machine comes furnished with a steel-bonded diamond wheel of your choice. Protractor also available.

For the complete story on Steel-Bonded Diamond Wheels, Resinoid-Bonded Diamond Wheels and Wickman grinders, write on your letterhead for this new 24-page catalog.

THE Wickman MANUFACTURING CO.

10325 CAPITAL AVENUE OAK PARK, DETROIT 37, MICHIGAN

upon our notice by sheer force of character. He might not even be aware of making an impression, but his mind would probably be set on becoming, one day, an assistant to some executive, and that good type, consciously or unconsciously, trims his sails accordingly. Others are more aggressively ambitious. There is nothing unconscious about their attitude in the matter. They know all the short cuts, and when they are not on their toes they are usually to be found treading on other people's in their anxiety to attract attention to their claims for recognition. Both types are the salt of the earth and the salvation of industry. They trust themselves upon us.

Some years ago, walking through the shops, I saw a young man, in his early twenties, striding briskly and purposefully towards a heavy casting. He was the slinger to an overhead crane, dressed in clean overalls and an open neck blue shirt which accorded well with his fresh complexion and sleek, black hair. Later, at intervals, I was to see this youth going briskly and expertly about his lawful occasions. He impressed me; I had good reports of him from time to time and eventually, by a process of advancement, he arrived in the progress section, later to become chief progress executive. But I did not pick him; he compelled himself on me. By his appearance, his actions, his conduct, he seemed to be mutely impressing on my senses; "Here am I; I have everything that goes to make a leader." And always with an open mind in the important matter of appointing, I feel, looking back, that I cannot truthfully claim to have picked this man.

C D MacKinnon
Airdrie, Scotland

Mutual Trust

I have read with interest the article, "Should You Buy Tool Design Work Based on Competitive Bids," (*AM*—April 27, '53, p 134), and agree with the author all the way. I am going to insist that some of our management group read it, as they have recently adopted a hard-and-fast policy with local tool shops, insisting that the shops take full responsibility for

the functioning of tools they design and build for us.

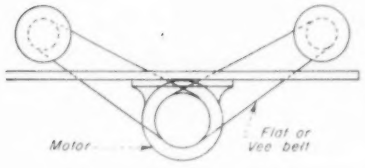
We review designs for construction only, including the tool material, but this does not absolve the toolmaker if the tools do not perform to meet our product quality-control requirements.

I feel that this policy must inflate prices, as the maker must necessarily cushion his bid to cover difficulties, often imaginary, which may arise during tool tryout in our plant. I agree that a feeling of mutual trust and confidence must be developed between manufacturer and tool shop so that, should any difficulty arise during tryout which might change the original thinking of both parties, a solution can be found that is satisfactory to both.

We must recognize the fact that, even though the best talent of each party reviews the design on paper, some factor may be overlooked which can well develop into trouble. This is particularly true when the item to be produced is made from hard-to-work material, or when the tool is complicated to a degree that there is an element of doubt in the minds of both parties as to whether a particular operation will perform as outlined in the operational sequence originally agreed upon.

This is the policy I adopted years ago, as master mechanic of an outboard-motor company. It worked out to everyone's satisfaction and is, I believe, the only way to work together. Both parties will be money ahead when a feeling of trust and confidence exists.

H F Ehrich
Los Angeles



Another Way

Referring to the Practical Idea "How to Improve Pedestal Grinders" (*AM*—April 13 '53, p174), it would seem to me that, unless the gears are enclosed in an oil-tight case, they would be very noisy. If so enclosed, they would be very costly. I enclose a sketch for a system that would be both quiet and cheap. It involves mounting the motor in a horizontal position and driving the two wheel spindles by flat or V- belts.

George Wolff
Clifton, NJ.

120 PAGES
PACKED WITH
VALUABLE FACTS
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CUTTING
TOOLS

If you design or buy cutting tools, you'll find a "gold mine" of useful information in the Gorham Tool Catalog! Complete with pictures, application data and specifications covering such tools as:

- PLAIN MILLING CUTTERS
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PLUS A 30-PAGE SECTION OF ENGINEERING DATA Covering:

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The Gorham Tool Catalog and as many extra copies of the section on Engineering Data as you can use are yours without obligation. Tell us how many of each you need, on your company letterhead.

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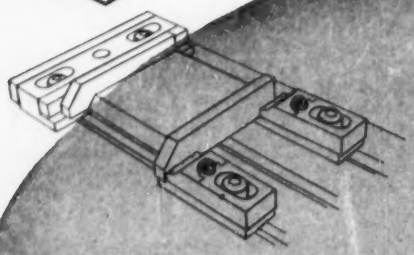
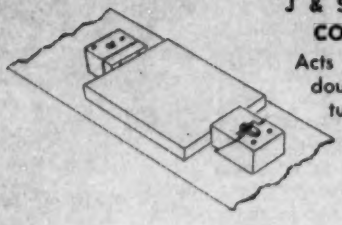


J & S DOUBLE ½ VISE
WITH MATCHING PARALLELS

- for unquestionable repeated accuracy
- for quicker set-ups
- for stronger grip
- for less obstruction

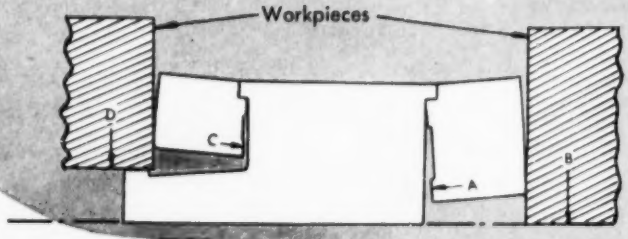
DOUBLE ½ VISE IN USE WITH ALL-PURPOSE JAW CLAMPS

for use on jig borers, millers, planers and shapers.



J & S DOWN-HOLDING COUNTER CLAMPS

Acts on same principle as double ½ vise (left). Fixture clamps operate on the same principle as the all purpose jaw clamps.



Hinged, Spring-Loaded Jaw Gives Positive Down-Holding Action

Hinged lip in-and-down action combined with in-and-down action of clamp holds workpiece against table and absolutely parallel. **Construction is of oil-hardened tool steel, ground and blackened.**

Jig Borers—quickly set up for jig-boring accuracy.

Millers—eliminates heavy miller vise and allows milling of more pieces.

Planers—eliminates strap and finger setups.

Shapers—eliminates vises.

Approximately 3 tons pressure closes Gap A, and approximately ½-ton closes Gap C—producing a down-holding action on each respective piece of approximately the same force.

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model "REC" with detachable micrometer base

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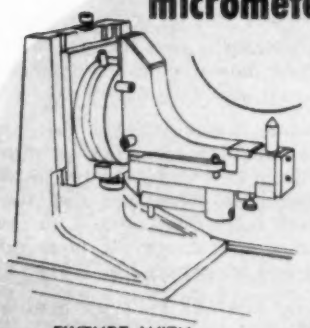
Fluidmotion

WHEEL DRESSERS

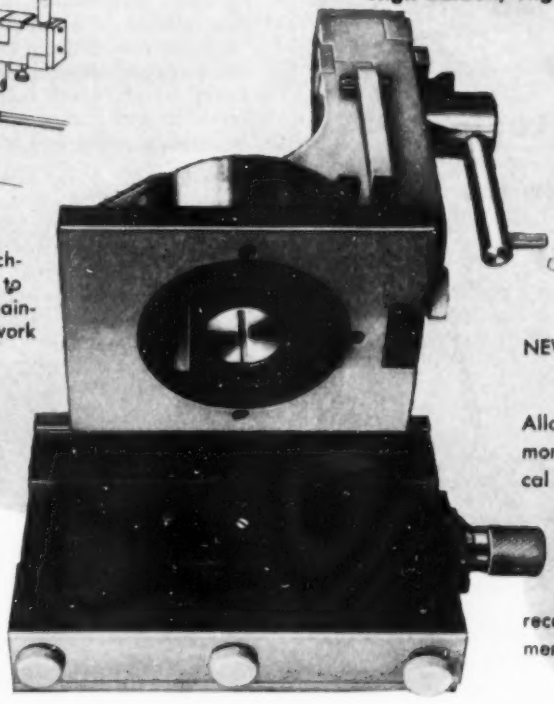
dress two angles tangent to a radius in one continuous motion

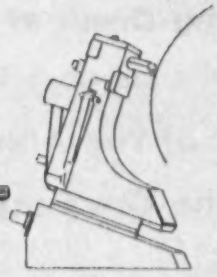
High-Carbon, High-Chrome Construction



FIXTURE WITH MICROMETER FEED

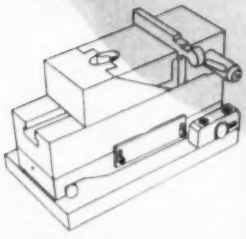
Under the wheel attachment makes it possible to dress under the wheel, maintaining any desired work height.





NEW SOLID ANGLE RAMP WITH MICROMETER LEAD SCREW

Allows fixed position of diamond when used in cylindrical grinding for dressing above the center line, but coincidental with the center line of the wheel. Factory will recommend proper equipment on request.

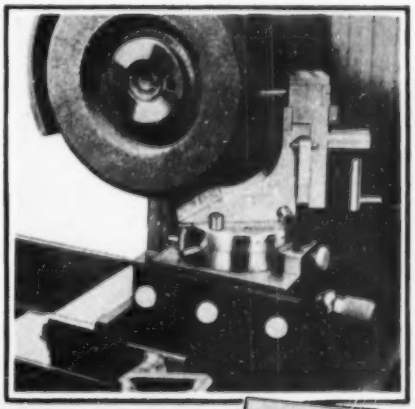


Precision Grinding Vise with or without sine bar allows rapid unloading and exact relocating.

Adaptable to All Types of Cylindrical and Surface Grinders

By loosening gib, dresser can be removed from the micrometer "C" Base and affixed to solid or adjustable angle ramp for cylindrical grinding. For surface grinding the dresser is returned to "C" Base.

Photograph on right shows special compound base with micrometer lead screw having travel in four directions. Dresser usually is furnished with extra stops for zero setting.



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ELMES INCLINED FORCING PRESS
makes this tough job easy . . . and saves 50%!

Forcing the Gear on Hoisting Drum of World's Largest Ladle Crane at The Alliance Machine Company

The Alliance Machine Company, Alliance, Ohio, builder of the world's largest cranes, gives credit to the Elmes Inclined Forcing Press shown below for making possible a *50% saving* on gear installation costs.

By their performance, Elmes Inclined Forcing Presses have earned an outstanding reputation as sturdy tools of production. Built in capacities from 100 to 1000 tons, these rugged, dependable presses are ideal for forcing heavy wheels, gears and pulleys on and off shafts; for inserting and removing bushings; for many other uses in manufacturing and maintenance.

Is your plant doing jobs like these the hard way—the costly way? Why not look into the advantages of an Elmes Forcing Press? They make the tough jobs easy. Your Elmes Distributor can give you details. Write for Elmes Bulletin No. 1055-A. It illustrates and gives major specifications on the complete line of Elmes Hydraulic Forcing Presses . . . Horizontal, Vertical, and Inclined.

ELMES 500-TON INCLINED FORCING PRESS forcing a gear (9'1" diam., 10" face) on the hoisting drum of a 400-Ton Alliance Ladle Crane — world's largest. Gear weighs 8,000 lbs. Drum o.d. is 89", length 13'3", weight 33,000 lbs. Pressure of 120 tons was required to force the gear into place.

American Steel Foundries

ELMES ENGINEERING DIVISION

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SPOT NEWS of Metalworking

- **House Armed Services Committee's recent approval of the Vance Plan** ($500 million for standby defense production lines) rectifies the "cart before the horse" situation that occurred when the House passed the budget, which included the Vance appropriation, before Congress officially approved the bill. The newly approved bill extends government authority under the Emergency War Powers Act and authorizes the government to build defense plants for production of tanks, aircraft, other armament and materiel.

- **Prices of some cemented carbide tools have been cut 15%** by General Electric's Carboloy Dept. Affected by the price cut are standard, single-point tools styles A through G, plus roller turners. And individual price adjustments are being made on other styles of tool blanks. Reason: savings from increased demand plus improved manufacturing methods are being passed on.

- **Republic Steel will produce 50,000 lb of powdered iron per day** at a plant to be built soon in Toledo, Ohio. Operation stems from newly developed, and patented, direct reduction process. Seven top US consumers have sampled Republic's powdered iron, have pronounced it "of excellent quality."

Weapons "system" plan is latest Air Force procurement development. Instead of government furnishing a lot of unrelated parts and components for eventual assembly by a manufacturer, prime contractor will buy or make entire package. Plan is being tried with the XB-58 plane Convair selecting and buying the bombing, navigation and communications systems, etc.

- **Unique recoil mechanism design permits changing of 90 mm gun tubes in 10 min.** on Patton tanks. Replacement formerly required 18 hours.

- **Communist China is starting 10 major machine-building projects this year.** Among them: a heavy machinery plant at Taiyuan, China's first automobile factory, a precision and cutting tool works, and an electrical machinery plant. Also from Red China: work is completed on a 140-ton turning, boring and grinding lathe that machines parts weighing up to 30 tons.

- **Aluminum bus bars will be made by Revere Copper & Brass** on a production basis for the electrical trade. They will soon be on the commercial market.

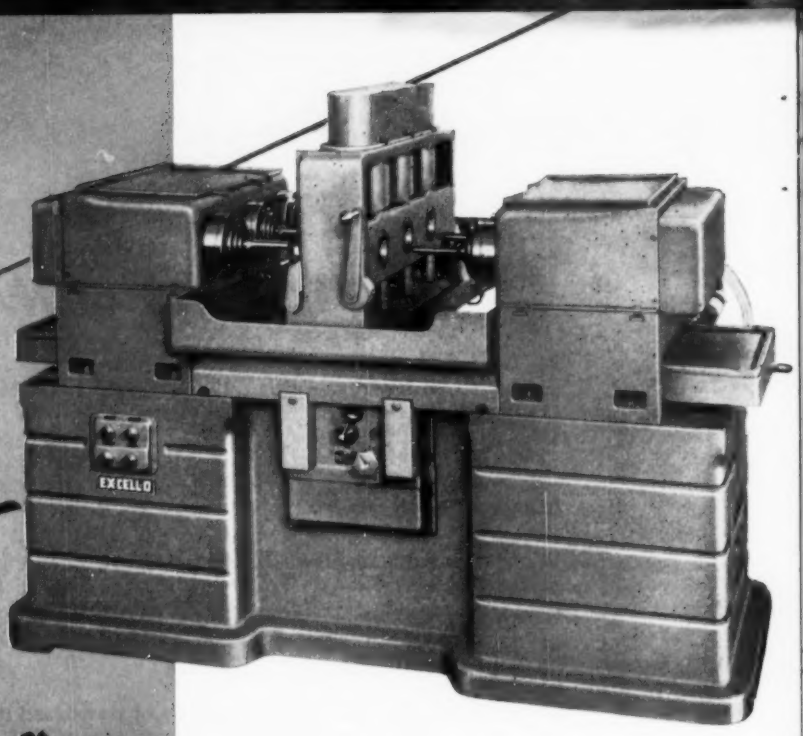
Plastics can now be pre-plasticized in an injection molding machine, eliminating bleed-back, simplifying machine cleaning and color changing, and cutting power consumption. Completely automatic unit is a British invention. Called a single-stage multi-screw preplasticizer, machine is claimed to produce parts three times as large as those made on existing units, at less cost, and of better quality.

- **Largest continuous heat-treating furnace in the world is being built** by Lukens Steel Co at Coatesville, Pa., for heat-treating armor plate, alloy steel and carbon steel plates. It will take plates up to 130-in. wide, 480-in. long, 3/16 to 2-in. thick, with temperature range of 950-1950 F.

- **Machine that shaves turbine-reduction gears without their removal from ship** is now being used successfully by the British Admiralty.

- **New electrolytic process produces titanium sponge from titanium oxide,** eliminating the several steps previously required to produce titanium from titanium tetrachloride. Pilot plant to produce the metal by the new process is being constructed by United International Research, Inc, in New York.

Style 17 Ex-Cell-O Precision Boring Machine equipped with new, inbuilt motor spindles for semifinish and finish-boring of wrist pin holes in automotive pistons.



Vibration-Free Boring

NEW INBUILT-MOTOR SPINDLES ON EX-CELL-O PRECISION BORING MACHINE ASSURE FAST, ACCURATE FINISHING OF PISTON PIN HOLES

Wrist pin holes in automotive pistons are given exceptionally fine surface finish by this Style 17 Precision Boring Machine equipped with inbuilt-motor spindles. Diameters are held within .0003" total tolerance. The inbuilt motor positively eliminates any vibration that might originate in belts and pulleys.

The thin walled parts are held firmly, yet without distortion in a fixture which provides perfect alignment for bores through both bosses. Interchangeable locators are provided to accommodate two sizes of pistons. This machine both semifinishes and finish-bores the pin holes. Production rate is high.

For further information on the many uses to be made of Ex-Cell-O Precision Boring Machines, see your local Ex-Cell-O representative or write today for Bulletin 31205.

The machine table feeds to the left for semifinish-boring, then to the right for finish-boring, assuring uniform stock removal for the finishing cut. New inbuilt-motor precision boring spindles are rigid and smooth running. Coolant is manifolded through the covers on both sides of the pistons.

EX-CELL-O
CORPORATION
DETROIT 32, MICHIGAN

MANUFACTURERS OF PRECISION MACHINE TOOLS CUTTING TOOLS • BABBITT PINS AND BUSHINGS DRILL JIG BUSHINGS • DAIRY EQUIPMENT AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS

53-21

Washington

The Wilson philosophy on defense contracts is sticking. While no sweeping cancellation of defense contracts has taken place thus far, about a billion dollars worth of munitions buying has been dropped. Cancellations have been selective rather than across the board and have been largely on the basis of weeding out the high-cost second source producers.

The Kaiser Motors contract was just an example. But there have been others too. Temco of Dallas was dropped as second source producer of McDonnell's F3H Demon Navy fighter. Also dropped is North American's ZAJ-2 twin-turboprop carrier-based bomber and Beech Aircraft's T-36 trainer, to have been turned out by Canadair Ltd.

Even so, not all the second sources are going out. General Motors, Douglas-Tulsa, and Lockheed-Marietta are still turning out airplanes under second source contracts. And there are still a host of other components manufacturers with firm second-source contracts.

Defense spending fell short of the 1953 goal by about $2 billion. Original figure for fiscal year was about $50 billions, including arms aid to allies. The actual figure was closer to $48 billions. That worked out to about $44.3 billions for direct military costs since July 1, 1952, plus another $3.7 billions for foreign arms aid.

• • •

But contracting seemed to hold its own. The defense Department let contracts for about $33.5 billion worth of equipment since July 1, 1952. Of this about $27.5 billion went for hard goods—aircraft, ships, tanks, weapons, ammunition, production equipment, electronics and other equipment, and $4.1 billion was let in contracts for soft goods, consisting principally of clothing, subsistence, and petroleum. The remainder—some $2.8 billion plus—went into construction contracts for military installations.

Heads NPA Metalworking

PERRIN G MARCH, III
New Director
Metalworking Equipment Division
National Production Authority

This brings the grand total of contracts let since the outbreak of Korea, three years ago, to about $114 billions. About 90% of this has been for hard goods alone.

Eisenhower now has an official agency whose job is to ward off a business recession—or another jolt of inflation, if that should be in the cards.

It is called "The Advisory Board on Economic Growth and Stability" (ABEGS). It is made up of a group of top-level officials of the key government agencies that have to do with economic matters. Chairman of the group is Arthur Burns, who is also new chairman of the President's council of Economic Advisors.

Members of the board include officials from the Treasury, Commerce, Agriculture and Labor Departments, and from the Budget Bureau and the Federal Reserve Board. Also a member is Eisenhower's Assistant for Economic Affairs, Dr Gabriel S Hauge.

This new staff agency is typical of Eisenhower's moves in other fields. The expectation is that the President won't adopt any really new business-stabilizing policies without first putting them through ABEGS.

Eisenhower's people figure ABEGS is a major effort at stepping up the machinery of government—and an answer to criticism from the Democrats that the Administration's policies are on the side of tight money—and deflation.

• • •

Another move in the economic field is designed to stop the rise in interest rates that has been rousing Democratic attacks on the Administration's "hard money policy."

The Federal Reserve Board has lowered reserve requirements at the banks to make sure that the cost of borrowing money doesn't go any higher in the next few months.

If the FRB had not acted, interest rates would shoot up when the Treasury begins to borrow to meet forthcoming deficit of about $5-6 billion. FRB has increased lending power of the banks by just about that amount.

Anti-trust policy seems to be in for a big turnaround. Eisenhower's new chairman of the Federal Trade Commission is planning a real shakeup of his agency.

Howrey's plan is to reorganize the FTC and its method of operation to encourage more voluntary and cooperative compliance with the law—and less reliance on legalistic trying of cases based on the letter of the law.

What this means is that businessmen will have much greater opportunity to sit down with FTC officials to work out solutions to antitrust complaints in order to get "compliance, not punishment."

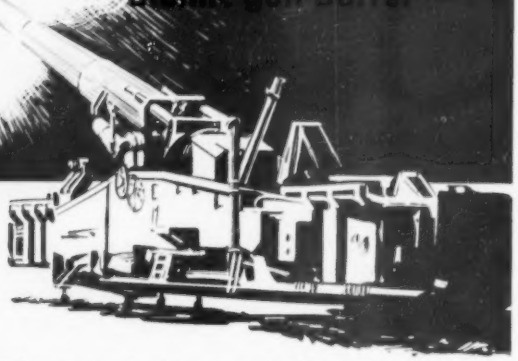
Microhoning

REDUCES COST

SIMPLIFIES PROCESSING

IMPROVES ACCURACY...

of 280 mm atomic gun barrel



Chosen over other methods, the Microhoning process is being used to generate the inside surface of the new 280 mm atomic gun barrel!

Microhoning . . . corrects all inaccuracies left by previous operations and generates a round, straight bore . . . eliminates several processing operations formerly required to obtain the necessary accuracy . . . facilitates broaching of the rifling by providing a true piloting diameter . . . assures a superior seal between the barrel and the projectile.

Constant improvement in this application has pro[duced] a Microhoning tool with a gage built into its nose, simplifying diameter checking and cutting 4/5 off the former Microhoning time!

This is another example of how Micromatic is continually developing new and better equipment for Microhoning all types of surfaces regardless of length, diameter, or material.

For complete information on Microhoning of gun barrels, write factory

NEW MICROMATIC TOOL CUTS MICROHONING TIME BY 80%

MICROHONING = STOCK REMOVAL + GEOMETRY + SIZE CONTROL + SURFACE FINISH

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MICROMATIC HONE CORP.
614 Empire Building
206 So. Main Street
Rockford, Illinois

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MICROMATIC HONE CORP.
MICRO-MOLD MFG. DIV.
231 So. Pendleton Avenue
Pendleton, Indiana

Detroit

Engine releases and expectations of releases are again in the automotive tooling news.

Pontiac seems to be about ready to let go on an engine program, despite earlier indications that it would use a revamped version of the Olds block. Some releases may already be out; at any rate, the trade expects substantial numbers of go-aheads. The moves will have to be made fairly fast. Pontiac is planning the engine for 1955.

Nash, meanwhile, seems to be thinking more concretely about a V-8 than at any time in the past. There is no indication of early releases yet, but in the light of engineering department activities such would not be surprising.

• • •

Inside word out of Flint is that Buick for 1954 will show a considerably restyled line of automobiles. That, coupled with the V-8 engine which Buick introduced the past year, should make the division a heavy contender for sales honors.

Buick had some trouble with the V-8 engine after introduction, not dissimilar to that usually encountered by introducers of brand new automotive products. Ring requirements are understood to have been changed, thereby solving oil consumption problems. The transmission has also been considerably quieted.

• • •

Meanwhile, Chrysler has confirmed the existence and production of its fully automatic transmission. It is standard equipment on Chrysler Crown and Custom Imperial models, and will probably be extended to the balance of the line for 1953—and maybe into other corporation nameplates as well. It has some advantages—far fewer moving parts than other automatic transmissions, and only 180 major parts compared with 218 to 295 in competing designs. It weighs 214 lb., as much as 100 lb. less than competitors. One reason: widespread use of light metal parts.

In the Chrysler area, meanwhile, the Amplex Div. has installed additional equipment to increase its production facilities. Most of the enlarged capacity will go toward pressing of stainless steel for bearings, gears, levers, blocks, cams and other machined parts.

• • •

Developments at Ford: Lincoln has completed and announced a new and exclusive air conditioning system, belt driven mechanically from the crankshaft and using the principle of recirculation. Suggested list price is $575. The Ford Division has introduced "Master-Guide" power steering, a Bendix development, an option which undersells practically all others in the field at a suggested list price of $125.

Willys Motors may make its own transmissions—it is none too happy over the recent production stoppages caused by the strike against its supplier, Borg-Warner's Warner Gear Division.

Willys has a plant at Anderson, Ind., now turning out aircraft engine gears and electronic assemblies. The indication is that when these programs are completed Willys may well shift the operation into transmission manufacture, for both Willys and Kaiser cars.

• • •

The auto industry built about 1.7 million passenger cars in the second quarter.

This was considerably less than the schedule of 1.9 million units originally set up.

First half assemblies of passenger cars is estimated to be around 3.2 million units.

The trend from here on will be down. Third quarter passenger car output will be 1.5 million units, or about equal to the first quarter.

Fourth quarter will bring an understandable drop-off to 1.1 million units. Model changeovers will cause interruptions to production. The winter market, slowest of the year, will be at hand.

This year, as a whole, promises to be a whopper. Total output of around 5.8 million passenger cars will be second biggest in history. Only 1950, stimulated by scare buying, was larger.

Those figures are for US plant production alone. For the year as a whole you'll be able to add another 320,000 or so Canadian autos. In addition to 6.12 million automobiles, the two countries should build about 1.2 million trucks —real rarified level volume.

• • •

Coincidental with the increased prices on steel, that material is getting easier to obtain.

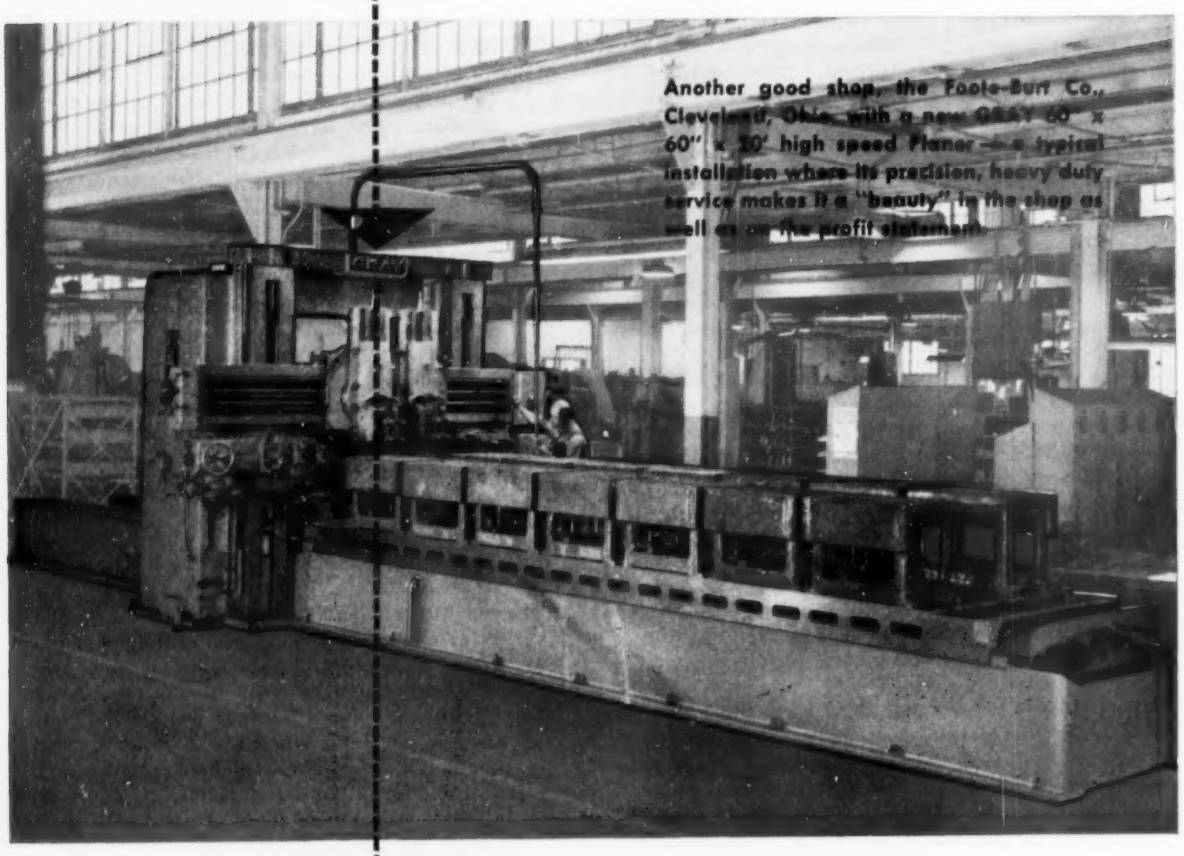
It is not altogether the result of the increases, although they doubtless play some small part. More significant in the increased availability of sheets and other shapes is the fact that the electrical appliance business is softening and reducing its demand.

Also at play is the probability that since controls went off companies have been doing what surface guessers did not expect—reducing their inventories rather than increasing them. Gradual inventory reduction, naturally, has somewhat curtailed steel demand at mill level.

• • •

Kaiser, engaged in consolidating automotive operations at the Willys plant in Toledo, received a body blow when the Air Force canceled its cargo plant contracts. Layoffs will run above 10,000 here as a result of the cancellations. This means a further easing of the slowly-loosening manpower pinch.

the sign of a good shop



Another good shop, the Foote-Burt Co., Cleveland, Ohio, with a new GRAY 60" x 60" x 20' high speed Planer — a typical installation where its precision, heavy duty service makes it a "beauty" in the shop as well as on the profit statement.

a new **GRAY** planer

. . . recognized by machine shops throughout the world as the ultimate in planers. Built for high production with great precision, combining more original engineering developments and production features than any other planer . . . it is in such demand that GRAY is the largest planer builder.

Write today. Get the story on GRAY

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The G.A. **GRAY** *Company*

planers • milling planers
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CINCINNATI 7, OHIO, U. S. A.
SOLD IN CANADA BY UPTON, BRADEEN AND JAMES, LTD. • SOLD IN LATIN AMERICA BY MACHINE AFFILIATES

Machine Tools

July 1 was a significant date for machine tool builders and users.

Many rated orders for machine tools automatically lost their rating on that day.

Order M-41 stayed in force, but only the so-called A-to-E ratings continued to have any standing.

The 60%-40% ratio for defense and non-defense business still applies, except in the category of "critical machines" where 70%-30% stays.

Truth is, though, that defense orders received lately by the machine tool industry have not been over 30% of the total.

Not more than a handful of builders are feeling the pinch of defense orders to the extent that they are losing non-defense business on the basis of extremely long deliveries.

• • •

No one in Pentagon or elsewhere has the slightest idea about the amount of government purchases of machine tools in fiscal 1954 beginning July 1. Armed services will not know for awhile what funds they have.

The fact that the services will be taking back from contractors a certain number of machines the coming year does not mean that the buying of new machine tools by Pentagon will cease.

• • •

There are now or are going to be government surpluses of machine tools in several countries, partly as a result of cutbacks and stretchouts of defense production programs.

Latest reports from Britain indicate that more than 2000 European-built machine tools ordered by the British government have been delivered without being installed in any manufacturing line. They are in temporary storage.

These machines no longer are required, because the British program has been slashed.

• • •

The story goes that Continental builders refused to accept cancellations without full payments for the machines. Hence deliveries were not cut off.

All the US machines ordered by the British and delivered to them have been put to work.

Altogether, the British have taken some 12,000 machine tools from western European builders.

About 4200 came from West German companies. Fritz Werner, employing in 1952 around 3200 workers in West Berlin, shipped over 1600 milling machines to the British.

• • •

In Canada too, on a much smaller scale, the government now has some new machine tools in warehouses. No decision apparently has been made as to the disposal of these machines.

One possibility: They may be installed in Canadian arsenals to replace machines more than 15 years old.

If the US Department of Defense sticks to its present intentions, it will not sell to lessees the machine tools that it has put into their plants since Korea.

It is no secret that certain defense contractors insisted that the armed services supply them with specified makes of machine tools with which to produce defense items in the hope that later on the contractors could purchase these tools at a substantial discount.

Pentagon says that no bargain sales are to be expected. In fact, all of those machines will be retained in the national reserve.

• • •

Bill authorizing erection of series of exhibit buildings probably along Chicago lake front by Chicago Park Commission with some $6-$7 million of public funds has passed Illinois legislature and soon will be signed by the Governor.

These buildings will have more than 500,000 sq ft of space and will be suitable for future machine tool shows.

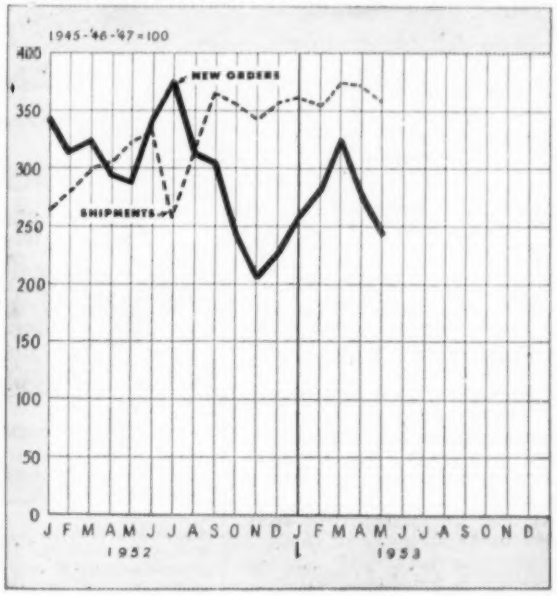
At this stage, architects have not yet been engaged but it is hoped that at least one of the buildings will be ready in 1955.

BF

MACHINE TOOL INDEX

(1945-47=100)

May 1953 new orders again demonstrated the sharp downtrend since the March peak by falling off from April's 276.8 to 247.2. Shipments also declined in May from 372.7 to 359.0.



News About Created-Metals

Cuts Inventory 50% with Standard Tools

A leading appliance concern recently reported: . . . "As a result of suggesting to the responsible Process Engineering group standard tools which would perform the same service at an initial purchase saving, as well as a substantial saving in procurement time, our inventories of so-called special cutting tools have been reduced by more than 50%."

News about the new Carboloy MTI Plan indicates that it is designed to work similar benefits for cutting-tool users.

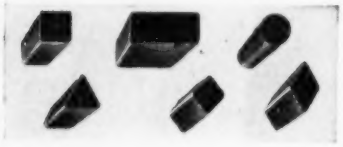
Details can be had by writing the Carboloy organization (address at right).

★ ★ ★

Complete Line of Insert Blanks

With the addition of two new diamond-shaped styles, the Carboloy line of carbide blanks for insert tools is now complete.

Available in 12 sizes, the styles



are square, rectangular, round, triangular, 55° diamond and 80° diamond. Blanks are available from Carboloy stocks or from Authorized Distributors.

★ ★ ★

New, Free Magnet Idea Kit for Shops

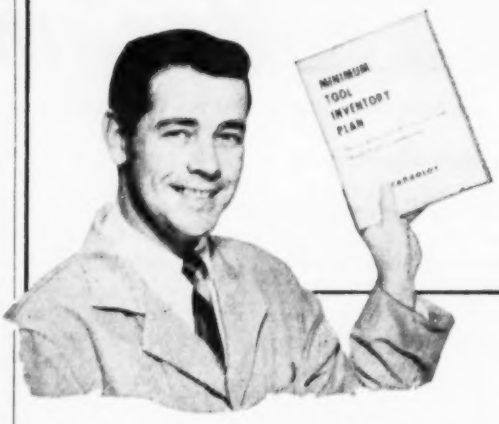
A handy, new literature kit showing the how's and why's of permanent magnets is currently sparking shop men to real savings in time and money.

The magnets have proved very effective as sheet steel separators, magnetic stands, tool-holding devices, sweepers' "pickup" tools and tool retrievers, to name a few uses.

Kit can be obtained free from Carboloy Department of General Electric Company. (See address at right.)

(Advertisement)

YOUR CARBOLOY FIELD REPRESENTATIVE SAYS . . .



"This reduces

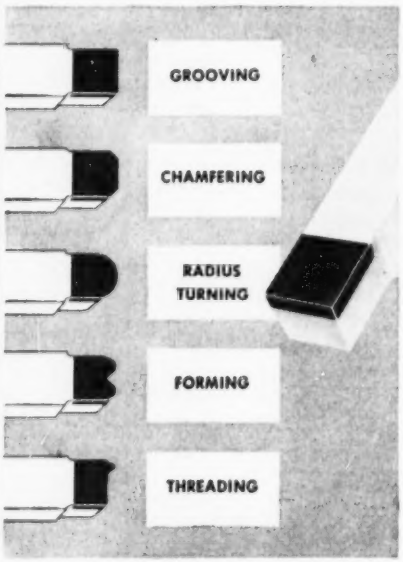
"It's an astoundingly simple, practical way for you to benefit from the low cost, wide adaptability and quick availability of Standard Carboloy Tools.

"Briefly, here's how the Minimum Tool Inventory Plan works: Instead of loading your shelves with special, made-to-print single-point carbide tools, you stock a lesser number of Carboloy 'Standards' . . . always available from distributors' stocks nearby. The MTI Plan shows you how to convert these Standards, *in minutes*, to handle about 80% of your special jobs.

"Your operating efficiency stays at par or improves. Your inventory goes down – about 30% or more. You cut out tooling delays, save on initial tool investment and tool cost. You streamline your inventory procedures, reduce tool waste . . . get many other benefits shop-wide.

"Send coupon for MTI Plan Kit."

1 ADAPTABLE for up to 80% of your single-point tool jobs



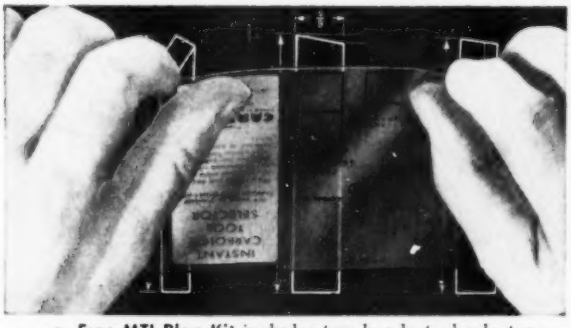
Above is a Style C Standard Carboloy Tool. It can be used "as is" for some jobs, or ground quickly to many special shapes. Five typical ways it can be adapted are shown.

There are only 11 styles of Standard Carboloy Tools . . . ready to be used "as is" for general turning, facing and boring . . . or quickly ground on regular carbide grinding equipment to fit those tricky special jobs. With Standards, you need *fewer* tools to do *more* jobs. Thus, you operate on lower inventories.

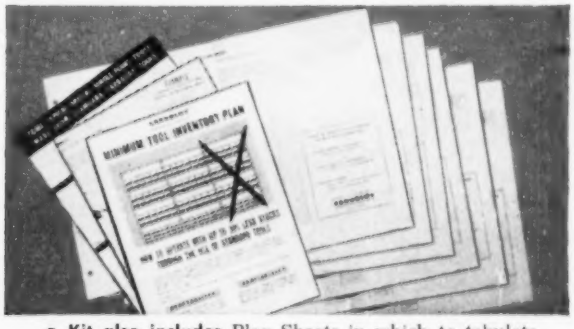
2 AVAILABLE always from nearby Carboloy distributors

You can get off-the-shelf delivery on Carboloy Standards in 98 cities from coast to coast. No waits. No production delays as with special, made-to-print carbide tools. Knowing you can get such speedy delivery of Carboloy Standards means you can cut your inventories still more.

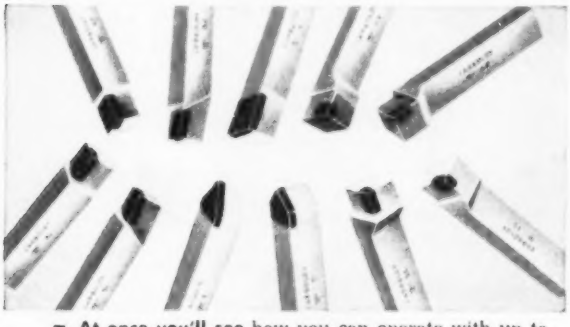
new Carboloy MTI Plan
your tool stocks up to 30%"



3 **Free MTI Plan Kit** includes two handy tool selectors. You place them over your special prints, find out quickly which Carboloy Standard best adapts to each job. Selectors are of transparent plastic.



4 **Kit also includes** Plan Sheets in which to tabulate your Standard Tool selections, and easy-to-follow Grinder Sheet which outlines simple way to convert the Standards to your job specifications.



5 **At once you'll see** how you can operate with up to 30% fewer tool stocks. Next step is to phone your nearby Carboloy Distributor for swift delivery on *only* the Standard Carboloy Tools you need.

6 **Should you have** the slightest difficulty getting the plan rolling, a Carboloy sales representative will call at your plant, help you smooth out the kinks. His expert services won't cost you a penny.

SEND COUPON TODAY—PINNED TO YOUR COMPANY LETTERHEAD—
FOR YOUR FREE MTI PLAN KIT

CARBOLOY TOOLS ARE STOCKED COAST TO COAST BY

AUTHORIZED CARBOLOY CEMENTED CARBIDE DISTRIBUTORS

Look under "Tools" in the Yellow Pages of your local telephone book or in Thomas' Register for your nearby Carboloy Distributor. He has complete local stocks and services. Ask him about the MTI Plan.

"Carboloy" is the registered trademark for the products of the Carboloy Department of General Electric Company.

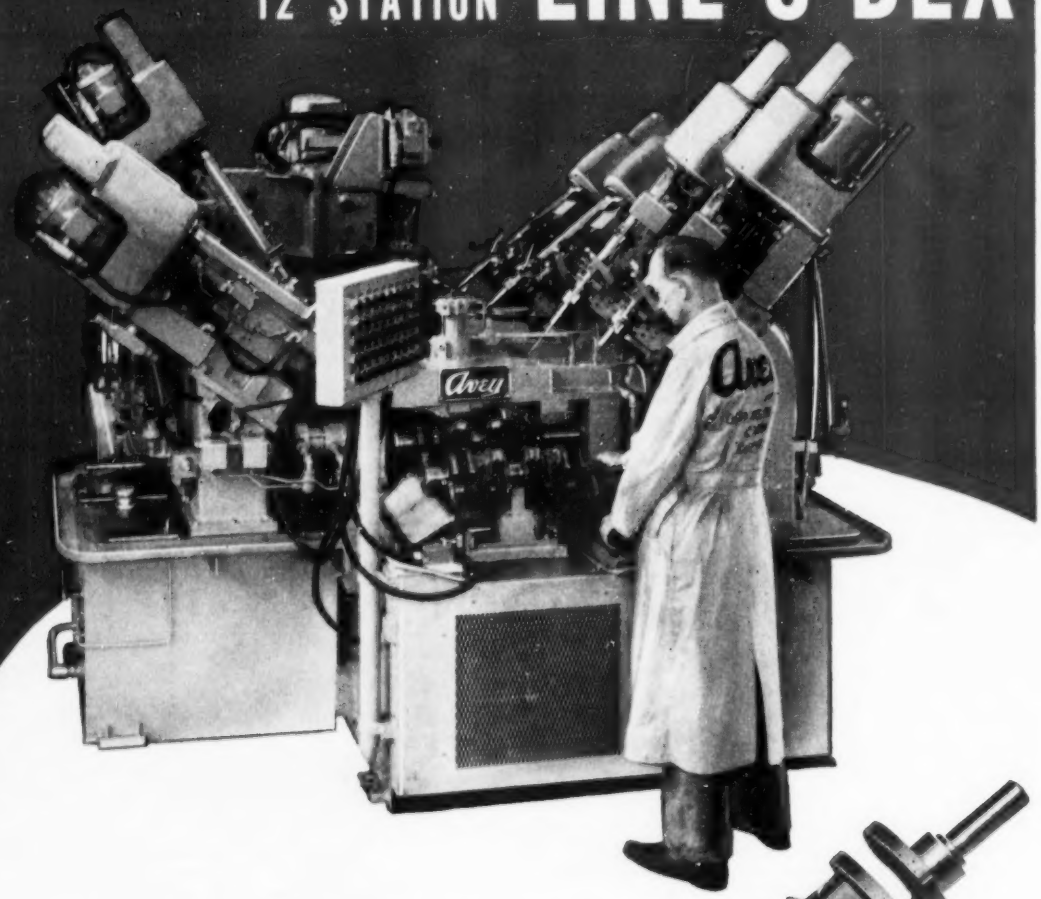
CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY
11149 E. 8 Mile Road, Detroit 32, Michigan

☐ Please rush me, at no cost or obligation, your MTI Plan Kit.
☐ Have your sales representative call, without obligation.

Name _____ Position _____
Company _____
Address _____
City _____ Zone _____ State _____

60 tractor crankshafts per hour with

Avey 12 STATION LINE-O-DEX



12 Station Transfer Machine—Hydraulically operated indexing mechanism—operations include drilling all angular oil holes plus connecting metering holes. Machine incorporates all Avey-draulic Torque-matic Units for Deep Hole Drilling with Avey Cam Units and Drill Heads for Meter Hole Drilling. Machine conforms to J.I.C. Standards.

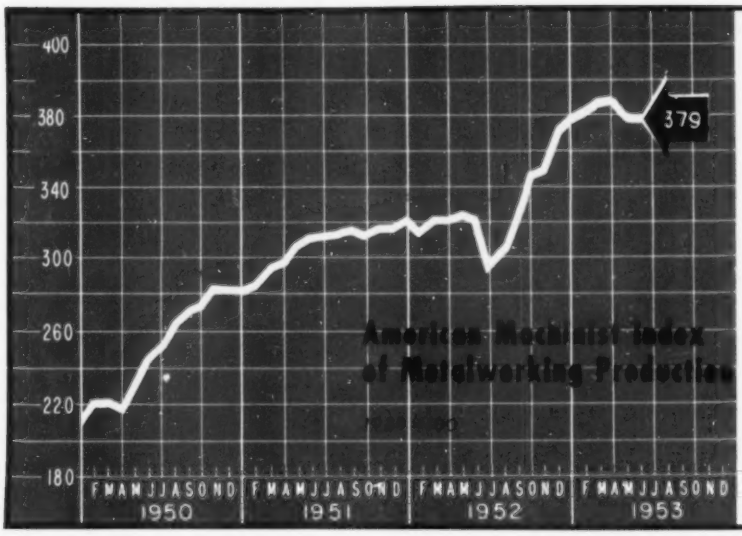
Avey

for drilling . . . tapping . . . production machines

THE AVEY DRILLING MACHINE CO.

Cincinnati 1, Ohio

Gaging Metalworking



PRODUCTION INDEX

BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	JUNE '53(*)	MAY '53(p)	APR. '53(r)	JUNE '52
Tot. Index..	379	380	382	322
Machinery	341	345	316	
Electrical Machinery	423	428	349	
Autos	321	321	228	
Other Transportation	605	603	538	
Other Metalworking	369	370	306	

(*) Estimated (p) preliminary (r) revised

Metalworking operations will dip considerably this month as a result of vacation shutdowns.

In Cleveland alone, 55 companies employing 17,613 workers will go down for one week, and 99 manufacturers with 53,007 employees will close for two weeks. Many of these companies are in the metalworking field.

Most of the closings appear to be scheduled for July. Thus the current month is likely to be the low month, with August bouncing back to a higher level.

• • •

No one expects, however, that Metalworking in the Fall will get back up to where it was in June —at 379 on the American Machinist Index.

It moved along at a breakneck pace all Spring, reaching an unanticipated peak.

Production will stay big. But it seems bound to slope off as defense output tapers and as makers of consumer goods, such as automobiles, slow down from their feverish recent rate.

• • •

Many steel users say that they will absorb the steel price hike as long as they can. Others are in a tizzy because they don't quite know what to do. Example, makers of farm implements and tractors, who aver that all recent steel increases, lumped together, may cost them $10 a ton or more.

Numerous steel consumers, especially of high-carbon steel, have oversize inventories. They won't be affected by higher steel prices for 3-6 months.

• • •

Mills still are solidly booked for third quarter, and some users have recently contracted for more conversion steel to be delivered sometime before the end of the third quarter.

Steel buyers are showing a growing hesitancy to order very far into the future. What's more, pressure for delivery is much stronger.

• • •

Malleable foundry output is at 80%-90%. Orders are off some, particularly from farm implement and automotive industries.

Steel foundries are running at about 80%-85% and promise to continue at that level.

Contract tool and die shops are reported working about 50 hours a week, though some companies are doing their best to cut out overtime wherever possible. Decrease in defense tooling has been largely offset by new tooling on redesigned civilian products. Backlogs of most shops are around 12 weeks.

• • •

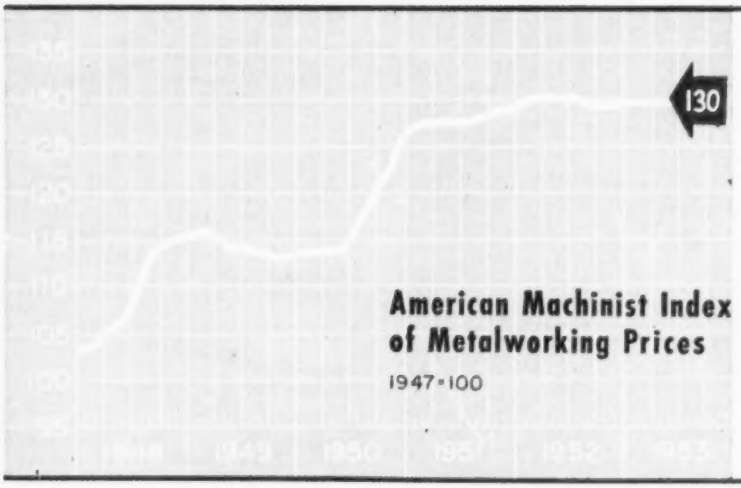
Tool and die industry shipments in April were off slightly from the same month a year ago. The same is likely to be true of May and June, when figures are available.

That is why the National Tool & Die Manufacturers Association said that April may have been the turning point in the three-year upward trend in shipments, with each month higher than the same month of the previous year.

Independent stamping shops report that 21% of new orders in May came from the automotive industry, 25% from the military and 54% from all other sources. In April, automobile companies supplied 32% of the business.

Fresh bookings slid down hill the past few months. They dropped to 139 in May from a peak of 200 in March (1947-1949 = 100).

Gaging Business



PRICE INDEX

	JUNE '53(*)	MAY '53(p)	APR. '53(r)	JUNE '52
Total Index	**130.2**	**130.2**	**129.9**	**129.4**
Metalworking Machinery	**138.9**	**138.6**	**136.7**	
Other Machinery exc. Electrical	**134.1**	**133.8**	**132.5**	
Electrical Machinery	**127.3**	**126.3**	**124.9**	
Fabricated Metal Products	**127.5**	**127.3**	**127.9**	

(*) Estimated (p) preliminary (r) revised

All indications point to a leveling-off in the nation's economy. And it looks like third quarter business will be much the same as that for the second quarter.

But business will step up its spending in the third quarter. Government expenditures should stay the same for the rest of 1953.

• • •

Weak spot on the business horizon is the fourth quarter. By then, capital spending will be on the downturn.

Inventories, now being built up, will be overpriced and manufacturers will be thinking ahead through 1954. Thus some liquidation of stocks can be expected.

US economic indicators, now at an all-time high, will be somewhat lower in the fourth quarter. For example, gross national product, now at a record $368 billion, is expected to drop to around $363 billion.

Industrial output may be closer to the 230 level than today's 240. (1935-39 = 100).

• • •

Prices are the thing to watch. Industrial prices have been firm or slightly rising in the last few months. And steel prices are going up again.

The steel increase should result in price rises right down the line. Although many industries absorbed the last increase, it looks like this time they will hike their prices so as to be in a better position if business should slide off at year's end.

Nevertheless, consumer incomes are high and are expected to remain that way through 1953.

And the public is buying 6% more than it did a year ago. All signs point to a continued high buying rate through the rest of the year.

Exception to this may be in consumer purchases of such hard goods as appliances, autos, etc, where passed-on steel price increases may cause the public to wait until prices drop.

WEEKLY BUSINESS INDICATORS

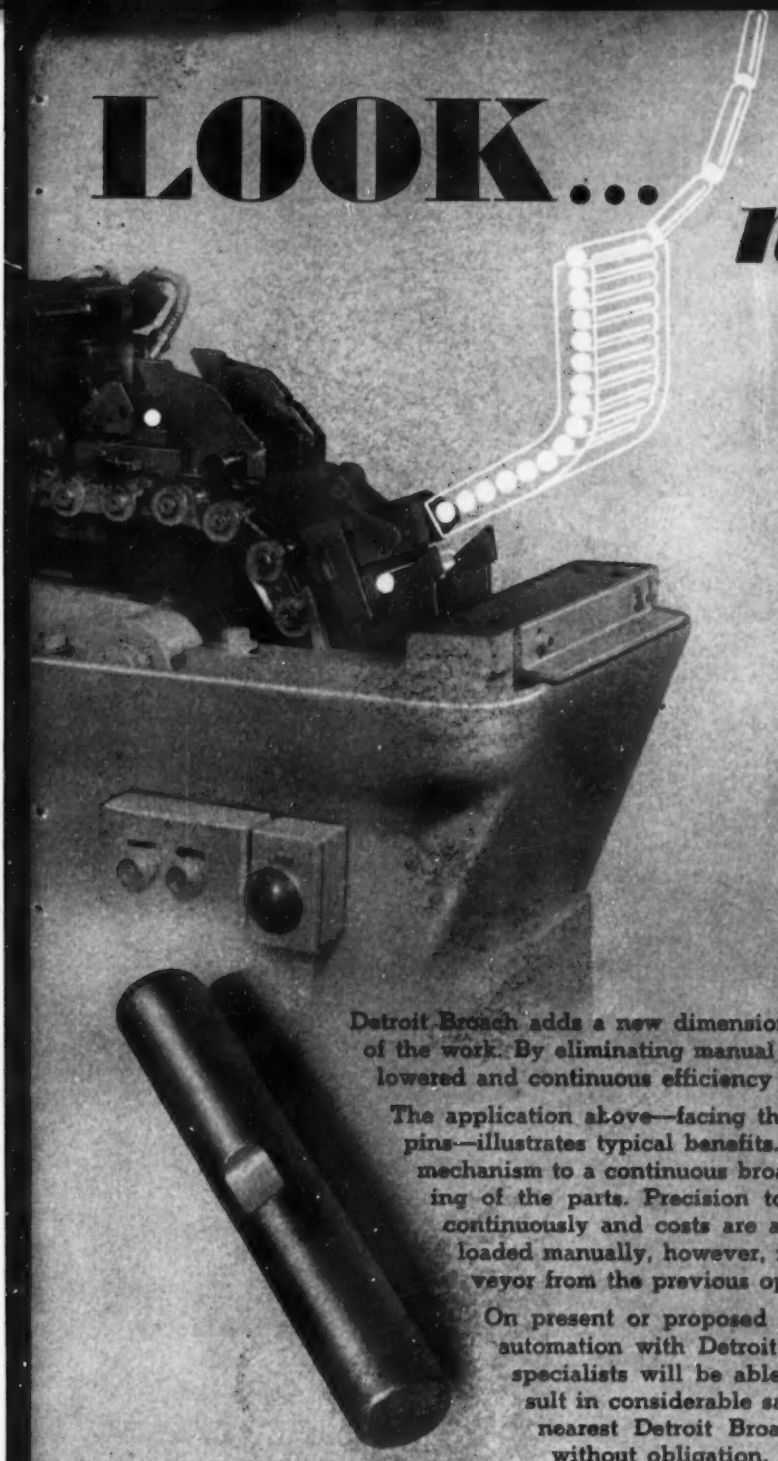
	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1923-25 = 100)*	261.2	260.2	220.4
Steel ingot production (thousand tons)	2,235	2,183	246
Electric power output (million Kilowatt hours)	8,329	8,245	7,254
Production of automobiles and trucks	170,311	166,832	129,317
Engineering construction awards (*Eng. News-Record*, millions)	$484.4	$249.7	$365.1

MONTHLY BUSINESS INDICATORS

	Latest Month	Preceding Month	Year Ago
Refrigerators sales (thousands of units)	367	428	255
Vacuum cleaners sales (thousands of units)	268	329	217
Washers sales (thousands of units)	288	346	217
Household electric ranges sales (thousands of units)	119	131	70
Radio production (thousands of units)	1,159	1,549	848
Television production (thousands of units)	568	810	323
Foundry equipment new orders index (shipments, 1937-1939 = 100)	303.0	396.7	385.1

* Seasonally adjusted.

LOOK... no hands!



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Combined to Increase Production 125%

Detroit Broach adds a new dimension in broaching economy . . . automatic handling of the work. By eliminating manual loading, production ceilings are raised, costs are lowered and continuous efficiency is assured *independent of the human element.*

The application above—facing the ends and producing a flat on automotive king pins—illustrates typical benefits. Here, Detroit Broach applied a hopper and feed mechanism to a continuous broaching machine and thus eliminated manual loading of the parts. Precision tolerances are consistently held, production runs continuously and costs are at rock bottom. In this application the hopper is loaded manually, however, in many instances the hopper can be fed by conveyor from the previous operation.

On present or proposed broaching operations it will pay you to discuss automation with Detroit Broach engineers. Chances are these broaching specialists will be able to come up with recommendations that will result in considerable savings for you. If you will just drop us a line, the nearest Detroit Broach representative will give you all the details without obligation.

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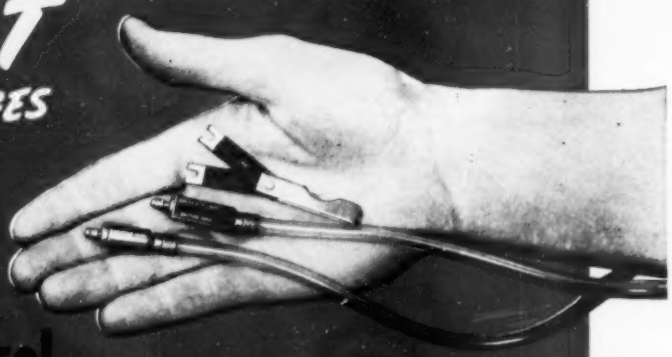
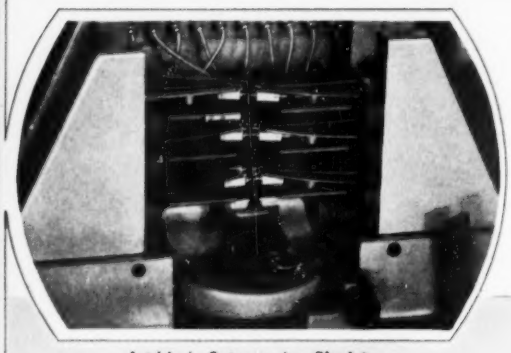
PLUNJET
GAGING CARTRIDGES

WIDELY USED For Inspection and Machine Control



The Plunjet is made with both rectangular and cylindrical short and long housings.

Plunjets with Precisionaire for checking jet engine blades.



Jet blade fixture using Plunjets.

PLUNJET GAGING CARTRIDGES . . . the self-containe ! gaging heads you can use practically everywhere, were developed by Sheffield in 1949.

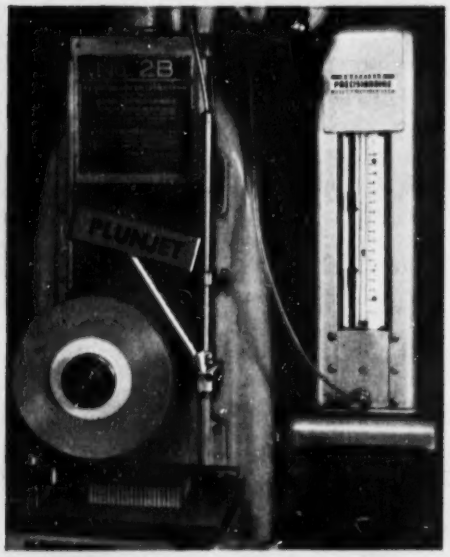
THOUSANDS ARE NOW IN USE on a wide variety of gaging fixtures and machine control applications.

MORE THAN FIVE THOUSAND are used on gages for checking jet engine blades.

PLUNJET GAGING CARTRIDGES ARE STANDARD LOW-COST STOCK ITEMS which can be applied by users to practically any gaging fixture or machine tool control where indication is required.

***WRITE FOR ENGINEERING DATA** giving ranges, amplifications, applications, mounting dimensions and prices.*

IMMEDIATE DELIVERY FROM STOCK



Plunjet feed gage enables operator to grind to a degree of accuracy previously impossible.

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American Machinist

MAGAZINE OF METALWORKING PRODUCTION ★ ESTABLISHED 1877

Why?

It is a safe bet that the Air Force forging and extrusion press program has received more publicity fanfare than almost any new production process in history. Page after page has been written about it in recent months, the Air Force itself generating many of the favorable stories.

Air Force officers combed the nation's metalworking industries to try to find enough facilities with which to carry out their unprecedented plans. They even flew to western Europe in a frantic effort to get capacity for building the castings and forgings within the designated time limit. They almost literally turned the heavy press industry upside down in scheduling production of the new mammoth presses.

NOW, WITH LITTLE WARNING, the program, which was proceeding at a feverish pace, has been badly slashed. Seven giant presses have been cancelled, despite the fact that some are more than half completed and that huge foundations have been dug to receive them.

At best, it appears that an appalling wastage is involved, running into tens of millions of dollars. Taxpayers' money has been used freely, with nothing to show for it except a useless mass of steel castings.

Aside from a general announcement about the cutback, the Department of Defense has retreated into silence behind a "security" curtain. Press builders have been asked by the Air Force to make no comment "for security reasons."

The public is entitled to a more detailed explanation than Pentagon has thus far been willing to give. Certain questions should be answered:

What justification is there for halting construction of machines half-built and thereby entailing a dead loss totaling tens of millions of dollars? Was the program grossly over-ambitious to begin with? Why were 17 presses ordered instead of 10?

If the plan is as sound as it was described to be at the start and it will take several years to get it going in full swing, why the major slash in it now?

Is the present action a mere yielding to political expediency or is there sound logic behind it?

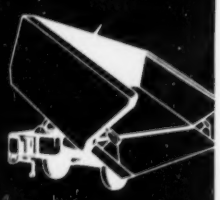
Clear-cut answers to these and similar questions would go a long way toward dispelling the idea that the Air Force, with billions at its disposal, doesn't know what it is doing.

Witness the weird meeting of machine tool builders staged by the Air Materiel Command at Wright-Patterson Air Base shortly after Korea, in 1950, when AMC officers conjured up a need for 265,000 machine tools—a figure that every well-informed machine tool man knew was unrealistic and utterly fantastic. Witness the Bullard-Fisher Body fiasco when Air Force officers grossly overestimated the defense demand for Bullards and the facilities at Fisher Body, tooled up at taxpayers' expense of millions of dollars, were not needed at all.

Let's have a full and open explanation of all the facts surrounding the heavy press program. That is the least that one can expect as an aftermath of the program's cutback.

Burnham Finney

EASTON simplified production and improved product with this CINCINNATI Press Brake



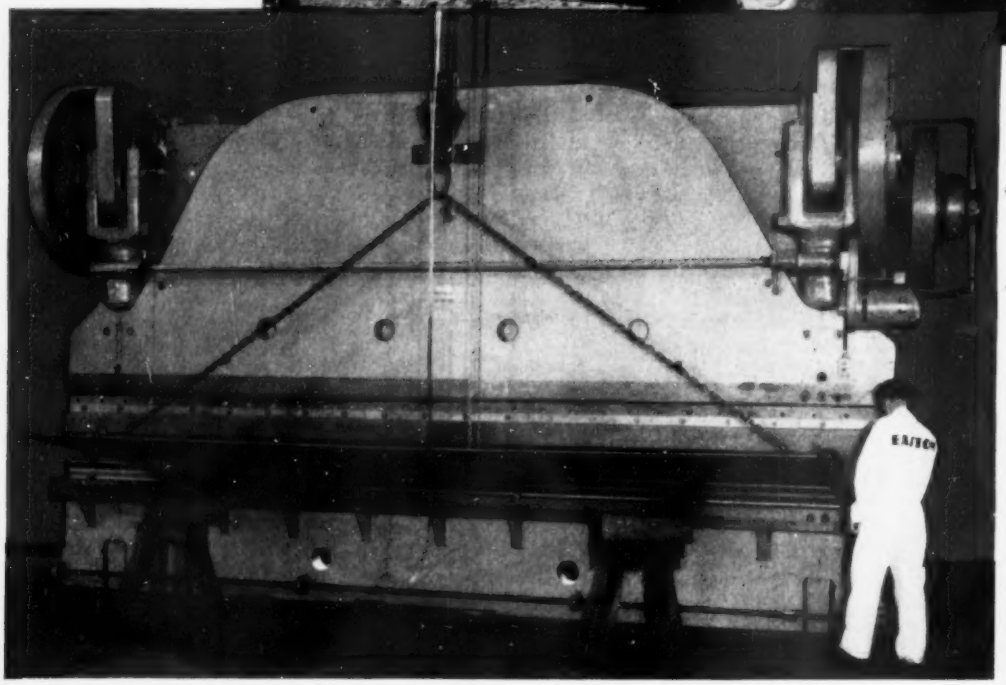


Illustration courtesy Easton Car & Construction Company, Easton, Pennsylvania.

Here a Cincinnati Press Brake is forming ½" plate for wide sections of off-highway trailers, at the Easton Car & Construction Company, makers of a large line of products for industrial transportation.

By using this Cincinnati Press Brake, some welding operations were eliminated, which improved the product, and reduced production costs at the same time.

The power, accuracy, and versatility of Cincinnati Press Brakes are reducing manufacturing costs where ever they are installed. If you form, or bend, you should investigate their possibilities.

Write for Press Brake Catalog B-4.

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PRECISION TUMBLING produces fine finish

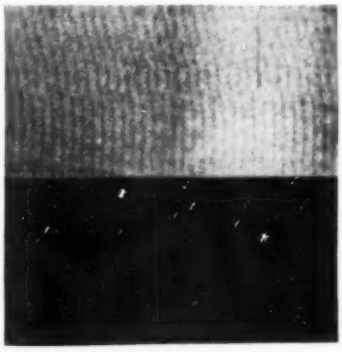
EXPERIMENTAL BARREL with glass front shows sliding action of work in abrasive. A regular two-compartment, rubber-lined, 1000-lb-capacity barrel, 32 × 48 in., with motor and controls costs about $1600. Jib crane, barrel truck, loading pan and screens amount to $600, and installation costs, with electricity, water, and drain available, average $150. Total cost is $2350

Proper control of abrasive, water, and additive, plus development of a sliding action of the work in the abrasive, adds up to a new technique, "Slidabrading," for removing burrs and producing a smooth surface

BY RICHARD DEPASTINA
Manufacturing Engineer
Headquarters Mfg Engrg Dept
WESTINGHOUSE ELECTRIC CORP
Pittsburgh

Processes for producing finishes through tumbling date back a hundred years or more. Tumbling processes used by industry today, however, differ so vastly from the old methods that a kinship is hard to imagine. Whereas old methods provided little abrading action, allowed no close-tolerance work, and produced no fine finishes, the modern method, termed "Slidabrading" by Westinghouse, is an accurately controlled, precision method that produces fine finishes on both ferrous and nonferrous parts.

Just ten years ago, tumbling was being done with very little control over variables and with no protection against nicking and scratching. Today, the speed of the tumbling barrel is controlled, as is the type and size of abrasive, ratio to work parts, and the amount and kind of compound or other additives. Furthermore, parts are always supported by a finishing medium, consequently do not normally drop during rotation. Water is added to the work load to obtain fine finishes on parts of all shapes, ferrous or nonferrous. An octagonal barrel with either wood or neoprene lining cushions the parts, preventing nicking and scratching.



SAMPLE BLOCKS were both surface ground, then bottom specimen was slidabraded. Note difference in surface finish (Actual size)

The abrading action that takes place in precision tumbling is concentrated on exposed edges, with material removal varying with the sharpness and relative exposure of these edges. On flat surfaces, while material removal is virtually negligible, there is an action that results in alteration of surface roughness. The degree of action in either case can be accurately controlled, and there is no tendency to uncontrolled nicking of surface, as often results in conventional tumbling.

Slidabrading can be used to improve the surface of a great variety of small parts when the problem is to remove burrs, apply a radius to edges, or polish the surface. Tests prove that abrasives and workpieces slide across the top of the mass in a thin layer when the barrel rotates. This allows fragile parts to be processed as well as heavy

TYPICAL PARTS AND TREATMENT

PART	MATERIAL	OPERATION	ABRASIVE TYPE & SIZE	COMPOUND	WATER	BARREL SPEED* (32" dia.) (R. P. M.)	TIME ‡ (HOURS)
4 1/8 in.	STEEL	DEBURR	ALUMINUM OXIDE 1/4"	** SODA ASH OR TRISODIUM PHOSPHATE	2" BELOW WORK LOAD	20	4 to 5
	STEEL	POLISH	STONE CHIPS 1/4"	*** BURNISHING SOAP	2" ABOVE WORK LOAD	15	1 to 2
1 5/8 in.	STEEL	DEBURR	ALUMINUM OXIDE 1/4"	** SODA ASH OR TRISODIUM PHOSPHATE	2" BELOW WORK LOAD	15	4 to 5
	STEEL	POLISH	STONE CHIPS 1/4"	*** BURNISHING SOAP	2" ABOVE WORK LOAD	12	2 to 3
1 1/2 in.	HARDENED STEEL	DEBURR	ALUMINUM OXIDE 1/16"	** SODA ASH OR TRISODIUM PHOSPHATE	LEVEL WITH WORK LOAD	18	3
	HARDENED STEEL	LUSTRE POLISH	1/8" STEEL BALLS	*** BURNISHING SOAP	2" ABOVE WORK LOAD	12	1
1 7/8 in.	COPPER	DEBURR	STONE CHIPS 1/8"	** TRISODIUM PHOSPHATE	LEVEL WITH WORK LOAD	12	2 to 3
	COPPER	POLISH	STONE CHIPS 1/8"	*** BURNISHING SOAP	2" ABOVE WORK LOAD	8	2
1 in.	COPPER	DEBURR	*SELF TUMBLE	ABRASIVE COMPOUND	* SEE NOTE	15	2
	COPPER	POLISH	STONE CHIPS 1/4"	*** BURNISHING SOAP	2" ABOVE WORK LOAD	12	3
1 7/8 in.	COPPER	DEBURR	STONE CHIPS 1/4"	** TRISODIUM PHOSPHATE	LEVEL WITH WORK LOAD	15	3 to 4
	COPPER	POLISH	STONE CHIPS 1/4"	*** BURNISHING SOAP	2" ABOVE WORK LOAD	10	2
1 1/2 in.	BRASS	DEBURR	ALUMINUM OXIDE 1/8" to 1/4"	** TRISODIUM PHOSPHATE	LEVEL WITH WORK LOAD	15	3 to 4
	BRASS	POLISH	STONE CHIPS 1/8" to 1/4"	*** BURNISHING SOAP	2" ABOVE WORK LOAD	10	1 to 2
2 5/8 in.	BRASS	DEBURR	ALUMINUM OXIDE 3/8"	** TRISODIUM PHOSPHATE	LEVEL WITH WORK LOAD	10 to 12	4
	BRASS	POLISH	STONE CHIPS 3/8"	*** BURNISHING SOAP	3" to 4" ABOVE WORK LOAD	8	1 to 2
2 3/4 in.	BRASS	DEBURR	ALUMINUM OXIDE 1/4"	** TRISODIUM PHOSPHATE	2" BELOW WORK LOAD	12	4
	BRASS	POLISH	‡ ALUMINUM OXIDE 1/4"	*** BURNISHING SOAP	2" ABOVE WORK LOAD	8 to 10	2

* Used on parts where the burrs are located on exposed edges and when surface finish is of no great concern. Parts are loaded into barrel and abrasive compound and water are added to form a paste solution on the parts.

** Wetting agent -- softens water and helps prevent rust until parts are dry.

*** Lubricant to prevent abrasive action, causes burnishing or barrel polishing only.

‡ Many polishing operations on parts can be made without changing the abrasive. In this case the aluminum oxide will produce a polished rather than a lustre finish on the part surface.

• For copper values, multiply by 1/2. For brass values, multiply by 2/3.

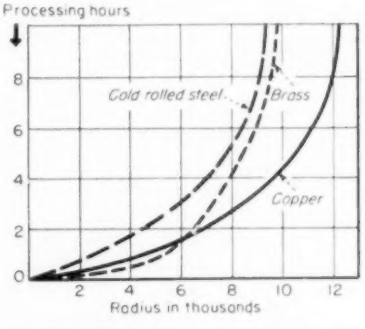
‡ For copper values, multiply by 1/3. For brass values, multiply by 1/2.

sections. Many simple parts, such as cut-off pieces of extruded shapes, are easily slidabraded merely by controlling the barrel speed and the type and size of abrasive chips. Yet it is surprising to note how few of these simple parts were formerly barrel finished without considerable battering, nicking, and scratching of the surface.

Caution and judgment must be exercised in selecting the proper conditions. Obviously a size of abrasive must be used that will not lodge in holes or recesses, or between prongs and other extensions. On the other hand, if action is required in holes or cavities, the size of chip must be such that it will pass through. On parts having heavy outside burrs, as well as small burrs around holes, it is advisable to use a combination of large and small chips. The large chips will remove the outside burrs faster, while the small ones will pass through the holes and remove the burrs around the edges. The second consideration should be based on the finish desired. Larger sizes of the abrasive will act more quickly, but will produce a rougher finish. Finer grades will act more slowly, but will give a finer finish.

As to types of abrasives, it has been found that nearly all parts that will stand the weight can be run more quickly with an aluminum-oxide abrasive. Delicate parts are usually processed in a smaller barrel with a finer abrasive. The abrading material is usually furnished in seven sizes, so a size can be picked for almost any part. Many other abrasives are available for special applications. A rubber chip filled with abrasive grain is available for parts requiring a light-weight mass of abrasive. Wooden balls and ground ivory nut are available for fine burnishing and polishing.

Under average conditions, the load (parts plus abrasive) should fill the barrel about 60% full. The weight ratio of parts to abrasive should be about one-fourth to one-third parts, the balance abrasive. Where parts are bulky and heavy, the ratio may be changed to allow more parts and less abrasive. With fragile parts it may be necessary to fill the barrel 75% full and to use a smaller, and sometimes lighter, abrasive to minimize the movement of the mass and better



RADIUS TEST CHART for CRS, copper, and brass blocks ground on all sides to produce zero radius starting point. Chips were ⅜-in. aluminum oxide in 32-in.-dia barrel, 17 in. wide. Load height was 55%, and water was level with mass. Detergent was added, and barrel speed was 15 rpm

support the work. Such parts should be loaded in layers, alternating work and abrasive. Where light-weight chips, such as rubber or wood, are used, the ratio should be by volume rather than by weight.

In unloading, parts should be poured out of the barrel directly onto a screen placed close to the door to avoid damage. Many ferrous parts must be dried soon after slidabrading to avoid rust, especially if run without soap or alkali. This may be done by running them through a solvent or alkali cleaner, by sawdust tumbling or, in some cases, by centrifugal drying.

ADDITIVES

Water is usually added to prevent the abrasive from loading, to keep the parts clean, and to provide some lubricating action. When aluminum oxide chips are used, the water level should be slightly below the level of the mass. If there is no problem of foam, as with rock chips, the water level is usually 2 in. above the mass. Less water increases cutting speed but gives a rougher surface.

With iron or steel parts, it is advisable to add about 1 lb of sodium carbonate (soda ash) or trisodium phosphate to each compartment. This helps soften the water, retards rusting during drying, and improves the chip-cleaning action. Such additives are not essential to the process if the parts are free from oil or grease. With aluminum and magnesium alkali must not be used, as it attacks the material.

Burnishing compounds may be employed when a high luster and smooth finish are required. Addition of burnishing soap (½% by weight of the abrasive) will stop nearly all cutting action and replace it by a polishing action. This makes it possible to first abrade, then polish, without changing the contents of the barrel, except for the water. These soaps and compounds act as lubricants and cushioning agents by preventing abrasion and nicking.

Where unusual conditions cause loading of the chips, an abrasive alkali compound may be added to maintain the stones in a clean, sharp condition.

WORK SHAPE and relative position of burrs affects time required for removal. Flat steel strip *A* with light burr would require about 1 hr at 20 rpm. After bending, as at *B*, with burrs on inside of arms, time would be 1½ hr. Formed as at *C* would require 3½ hr because burrs are protected and abrasive will not be under pressure. If arms were formed as at *D*, time would be 6 hr

Barrel speeds may vary from 80 to 200 sfpm, or 10 to 25 rpm with a 32-in. barrel. This range indicates that each part must be considered separately when determining proper speed. Generally speaking, the speed should be such that the parts do not drop when they reach the top of the barrel. They should turn over and slide gently over the medium.

The most commonly used barrel is hexagon or octagon, and a popular size is 32 in. in diameter. It may have from one to six compartments, the length being governed by the number of compartments. In selecting the size of barrel, consideration must be given to the size of the parts. The larger the barrel the greater the sliding distance and the faster the abrading action. However, too large a barrel may result in costlier operation on small volume.

The material largely determines the length of time and speed at which parts should be subjected to the sliding action. Soft materials, such as copper, brass, aluminum and magnesium, can be abraded in a small fraction of the time required for iron and steel, assuming shapes are identical. Another factor is the location of the burr to be removed.

Burrs can be removed from small stampings, screw-machine parts, or other parts in an average time of 1 hr. A large quantity can be finished at one time, the total number depending on the size of part, size of barrel, and surface smoothness required. The time required to process these parts while in the barrel should not be considered labor time. The total labor time involved in such setups is that required for loading and unloading the barrel and occasional screening of the abrasive.

A recent problem involved an aluminum casting which was deburred manually because of low production activity. Activity increased to such an extent that manual deburring became a large cost factor. Samples were submitted to our laboratory for recommendations on the best process for deburring and polishing. Several tests were made and proved slidabrading could eliminate 96% of the labor of manual deburring. A similar reduction was made on several breaker parts which had been manually deburred, polished, and buffed because of low activity. In this case the annual savings from the use of slidabrading totaled three times the original cost of the equipment purchased.

Westinghouse is using this method of tumbling in nearly all its operating divisions. Parts so treated include breaker parts for switchboxes and transformers, jet-engine components, contacts, and switchgear, motor, and refrigerator parts.

Because of the many items which lend themselves to slidabrading, as compared to our former manual deburring operations, this process opens a large field in our constant cost-reduction program. At many of our company locations, in addition to the Manufacturing Engineering Laboratory, studies are being carried on to find better slidabrading techniques for routine, as well as special, applications.

"He got in the way of a guided muscle."

ENGINEERS MUST CONSIDER PRODUCTION COSTS

BY RICHARD H LUDERS, Production Design Engineer
LOCKHEED AIRCRAFT CORPORATION

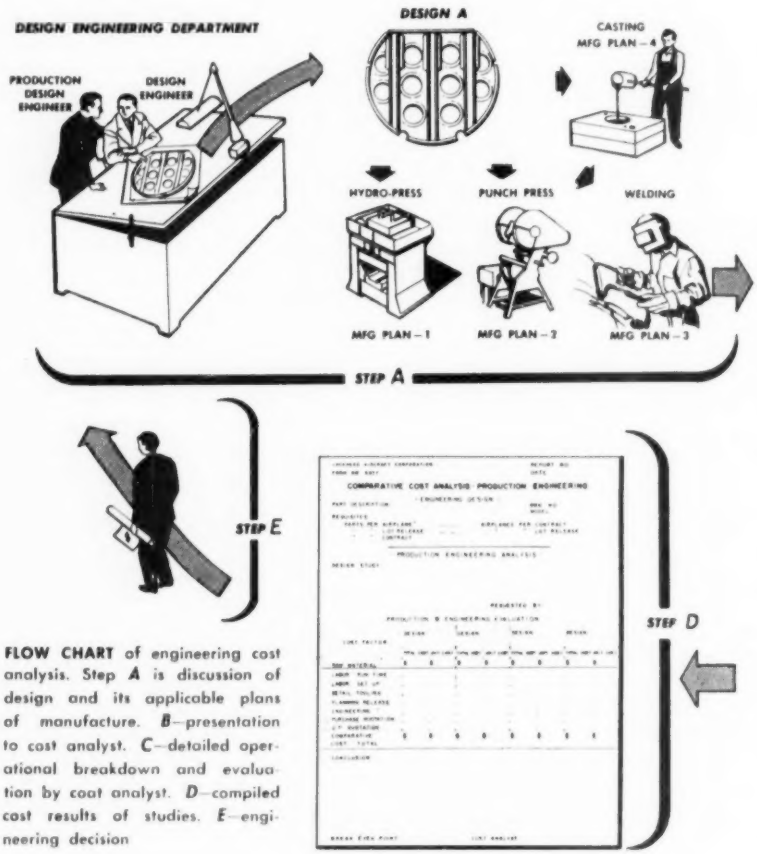
Drawing boards are no longer occupied by the designer alone. Four other groups cooperate to influence his thinking

Engineering design is a major factor in final cost, particularly in airplane work. Here's how Lockheed keeps its engineers production-cost conscious

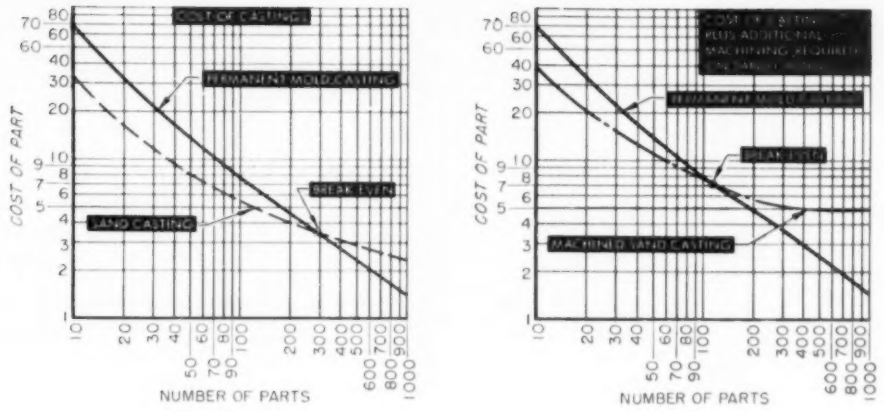
On a cold December morning in 1903, the Wright brothers successfully accomplished sustained and controlled flight of a motor-driven airplane. The demonstration divulged the use of movable control surfaces and the establishment of a constant center of gravity within the aircraft structure. It differed from earlier practices in which control was acquired through the pilot shifting his weight. This was one of many historical incidents which placed responsibility on engineering for stability, performance, and structural soundness of airplanes. As the airplane advanced, it was realized that its commercial use depended on design for economic production and procurement.

The intervening years stand as a monument to engineering's acceptance of that responsibility. The present and future are still a challenge, as is the problem of cost. It is of the utmost importance to the manufacturer and his customers to keep costs as low as possible. The airframe manufacturer, in selling to the Armed Forces, realizes there is no hypothetical pork barrel from which any price can be drawn. Rather, the price is based on strict competitive determination, requiring subsequent series of renegotiations as the production of the model progresses. In selling to the airlines, the features of appearance, payload capacities, performance, and service are compounded with respect to the price to be paid for the delivered airplane. The airframe manufacturer himself is confronted with administrative and operational costs of engineering, manufacturing and tooling predicated upon the price the sales division can obtain for his product.

In considering these costs, Lockheed Aircraft Corp has recognized for some time that the engineer establishes the minimum cost of manufacture through his design. How many times has it been said that "if the design had been right, the part could have been simply and easily made?" Therefore, as an individual or a group, the engi-



FLOW CHART of engineering cost analysis. Step *A* is discussion of design and its applicable plans of manufacture. *B*—presentation to cost analyst. *C*—detailed operational breakdown and evaluation by cost analyst. *D*—compiled cost results of studies. *E*—engineering decision



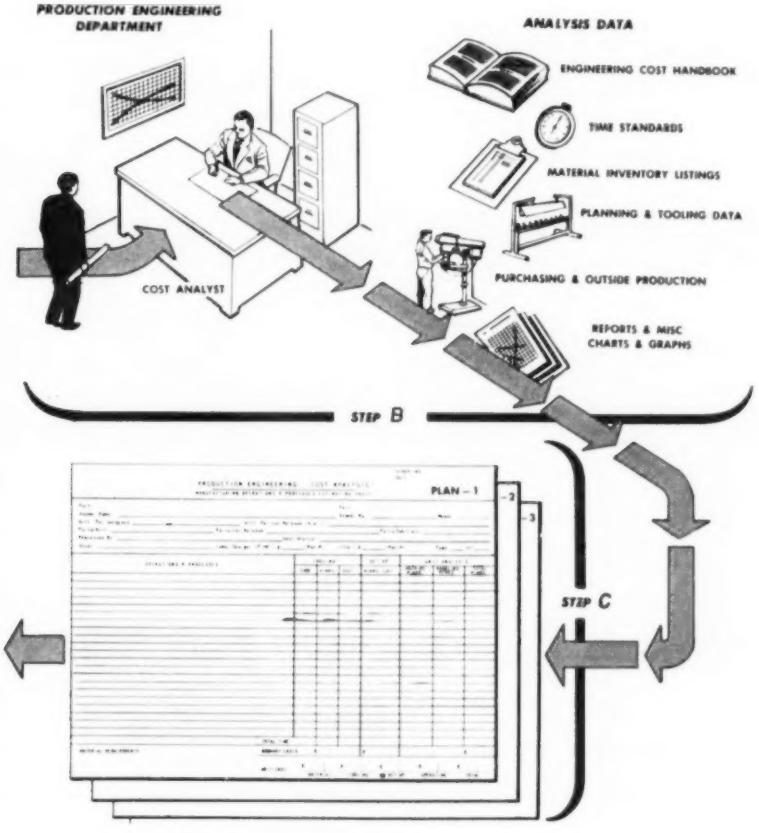
PERMANENT-MOLD CASTINGS frequently produce substantial cost savings. These charts for a given part show the influence of quantity on cost

neer must have means open to him for counseling with the sales, manufacturing, and tooling divisions during the pre-release stages of the design. From Sales, he learns the proposed price of the airplane, quantities, schedules, and the customer's requirements. From Manufacturing, he learns how his design affects methods of fabrication, assembly, and installation, as to cost and producibility. From the tooling division, he learns how his designed tolerances, features of interchangeability, and structural breakdown affect the tooling cost.

These ideals of advisory and cooperative efforts have materialized at Lockheed through staff organizations. The three most influential are the production design engineers of the production engineering dept, the pre-planners of the manufacturing division, and the change board committee of the master scheduling and manufacturing division.

The most direct organization serving Design Engineering is the Production Design Engineers Group. These men, experienced in engineering and manufacturing principles and methods, and having complete knowledge of the plant operations and organization, are qualified to assist in advancing economical and producible designs. They are located in the design areas and circulate among the drawing boards to discuss with designers the production aspects of unreleased designs or design changes. These designs are viewed to ascertain applicable methods of fabrication, assembly, or installation; type of material used; production tooling required; and the use or possible substitution of standard or semistandard parts.

Study of these considerations is dependent on the aggregate costs involved. It starts with the fabrication of the detail part and follows through with its assembly to other parts to form a functioning unit or section. Possibly a savings in cost can be achieved by eliminating an assembly of several parts by substituting a single part. To be specific, a subassembly design composed of multiple aluminum sheet-metal details may be better designed as a one-piece sand casting. Even this can be improved by designating either a permanent-mold or centrifugal type. These



types of casting minimize machining costs because of the greater detail and closer tolerances obtainable in casting. Machining costs, as well as the amortized tooling charges and unit casting costs, must be balanced out against the quantities to be produced.

From cooperative study of the design, definite advantages can accrue. In this case it results in (a) reduction in the number of parts, multiple versus one-piece, (b) certainly simplification of design, (c) possible weight savings (most important to aircraft), and (d) definitely a savings in cost—quantities permitting.

ANALYSES MADE

In cases where the cost factors are not apparent, the production design engineer may make a detailed evaluation himself. In the more complex studies, he may request a comparative cost analysis. However, his signature on the released design signifies approval and agreement between the designer and production design engineer of its economic production.

The second organization serving cooperatively with Engineering are the preplanners (Manufacturing Engineers) of the manufacturing division. This group, experienced in methods of manufacture and tooling practices, and working from the preliminary designs, prepares a manufacturing plan, embodying the production concepts of the airplane. This work is carried on jointly with the designer and production design engineer.

The manufacturing plan first considers structural versus production-type breakdown of the airplane's components. This is most important, as it establishes the basic factors of producibility. To those outside the industry, structural breakdown divides the airplane into the usual engineered sections of wing, fuselage, wing tip, aileron, etc, each being assembled as a functioning unit. The production breakdown differs in that these same sections may be more or less complete in number of parts than the structural breakdown requires. A production breakdown facilitates the operations of fabrication, assembly, or installation of the section. Invariably, it results in more efficient tooling or more productive use of the same tooling. All these advantages, when tabulated, result in savings in time which ultimately mean savings in cost. This is recognized in the pre-planning of the production model, and complete concurrence is essential.

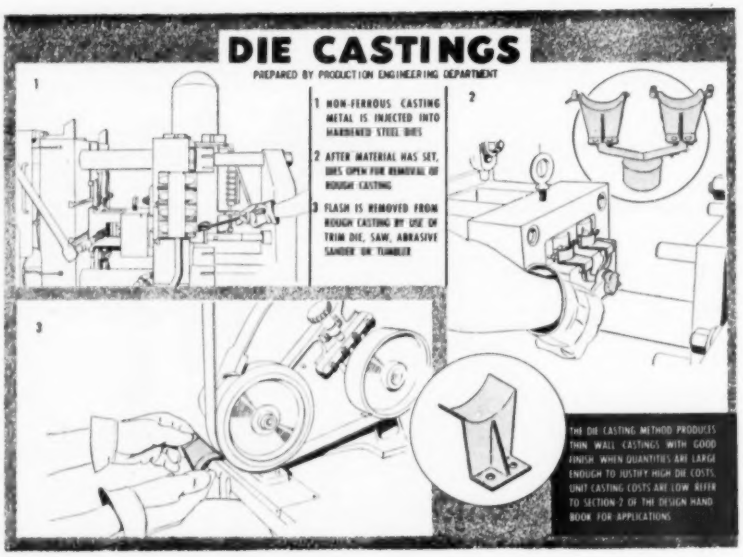
With this focal point established, the next development in the manufacturing plan considers the design with respect to the production schedule rate and the total quantities to be produced. To illustrate, a detail for the prototype model machined from bar or billet stock would be a machined casting or die forging for production. In other words, all producibility features are incorporated into the plan of the production version. In final form it clearly defines the problems of interchangeability and master tooling, and includes flow charts or target plans of the entire production fabrication and assembly flow of parts and sections.

The third organization, the Change Board, deals with design changes that affect existing designs of details or sections. This group of representatives from the manufacturing and tooling divisions, functioning under the auspices of the change board coordinator from the master scheduling division. considers the design changes first as to their need and urgency. Is it a change requested by the customer who is willing to pay for its incorporation? Is it a change for manufacturing convenience, and will it either cost the company money and loss of time, or result in reduced cost and time? These problems, along with changes to schedule commitments, materials, tooling, and manpower require serious consideration and definite dispositions.

COORDINATOR'S FUNCTION

It is easy to realize the confusion that could result from introducing a design change into the flow of system and process of manufacture that has been set in motion. Thus, to put the change into effect, the design-change coordinator supervises the details. He sees that the necessary blueprints, shop work orders, material requisitions, tool orders, and other procedures are initiated by issuing a Design Change Work Order which has been approved by each change board member and certain company officials. The design change work orders are dispatched to every segment of the company which will have any part in making the change-over.

How does this affect Engineering? It is another means of hammering home costs. Each change is analyzed by the board for the time expended in Engineering,


DIE CASTINGS
PREPARED BY PRODUCTION ENGINEERING DEPARTMENT
1
1 NON-FERROUS CASTING METAL IS INJECTED INTO HARDENED STEEL DIES
2 AFTER MATERIAL HAS SET, DIES OPEN FOR REMOVAL OF ROUGH CASTING
3 FLASH IS REMOVED FROM ROUGH CASTING BY USE OF TRIM DIE, SAW, ABRASIVE SANDER OR TUMBLER
2
3
THE DIE CASTING METHOD PRODUCES THIN WALL CASTINGS WITH GOOD FINISH. WHEN QUANTITIES ARE LARGE ENOUGH TO JUSTIFY HIGH DIE COSTS. UNIT CASTING COSTS ARE LOW. REFER TO SECTION 7 OF THE DESIGN HAND BOOK FOR APPLICATIONS.

POSTERS illustrating various production processes help familiarize the engineer with the various methods by which his designed parts can be produced

Manufacturing and Tooling in complying with this change. If it creates savings of labor, tooling, or material, this is balanced against the above costs. In the end, these procedures place a price tag on the design change.

By no means is the engineer to be considered an accountant or cost analyst. However, where his design so influences the manufacturing costs of the product as it does in the aircraft industry, it is essential that the designer have a working knowledge of costs.

HOW ENGINEERS LEARN

There are many ways of introducing these costs to the engineer. Like other companies, Lockheed sends its new engineering hires or rehires through a company training school. This orientation into specific company engineering design practices and procedures is enhanced with brush-up lectures on (a) manufacturing methods, (b) materials and processes, (c) new developments in forming machinery and, (d) the analysis of manufacturing costs as applied to design. This introduction to cost explains to the engineer his responsibilities in this respect. Examples of cost analysis of comparable designs are illustrated and presented. For his use, in the Engineers' Design Handbook, there is a cost consideration section. This presents the cost of raw materials, castings and forgings, fasteners, assembly and installation costs in charts or graphs and gives him a quick source of general information.

In the more complex cases where the designer and production design engineer are concerned with a design which could be produced by more than one method, a formal cost analysis is requested. This is to decide the most economical method. In making a comparative cost analysis, each method is broken down into its operational elements and, with time standards and burden rates applied, the labor cost factor is ascertained. The cost of the raw material, the tooling charges and the engineering and manufacturing planning time expended, complete the evaluation. This analysis tells the unit and contract cost of various alternate methods. With function and strength of the design remaining the same for different means of manufacture, the most economical method will be incorporated. However, one factor, particularly peculiar to aircraft, *weight*, can in some instances offset cost. This would be where the least expensive design part may weigh more than the other designs.

COMPARATIVE COST ANALYSIS — PRODUCTION ENGINEERING DEPT.

ENGINEERING DESIGN

PART DESCRIPTION: FITTING - FUEL PROBE SUPPORT — DRAWING NO. 3132, MODEL A

REQUIREMENTS:
PARTS PER AIRPLANE 32 — AIRPLANES PER LOT RELEASE 15
PARTS PER LOT RELEASE 480 — AIRPLANES PER CONTRACT 250
PARTS PER CONTRACT 8000

PRODUCTION ENGINEERING ANALYSIS

DESIGN STUDY: # 1 SHEET METAL DESIGN; # 2 DIE CASTING

REQUESTED BY E.A. GREEN, W.A. RIDING

PRODUCTION AND ENGINEERING EVALUATION

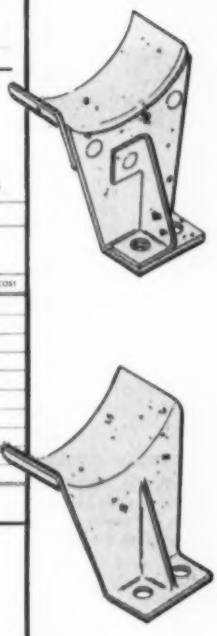
COST FACTOR	DESIGN NO. # 1 SHEET METAL		DESIGN NO. # 2 DIE CASTING		DESIGN NO.		DESIGN NO.	
	TOTAL COST	UNIT COST	TOTAL COST	UNIT COST	TOTAL COST	UNIT COST	TOTAL COST	UNIT COST
RAW MATERIAL	$	$ 0.09	$	$	$	$	$	$
LABOR—RUN TIME		0.53		0.13				
LABOR SET UP	31.81	0.07	3.95	0.01				
LABOR ASSEMBLY								
DETAIL TOOLING	1037.40	0.13	976.40	0.12				
PLANNING RELEASE								
ENGINEERING RELEASE								
PURCHASE QUOTATION				0.19				
O. P. QUOTATION								
COMPARATIVE COST — TOTAL	$	$ .82	$	$ .45	$	$	$	$

CONCLUSION: From the above cost analysis, Design #2, Die Casting, is $0.37 less than Design #1. For the quantity involved the total savings are $2,960.00.

Design #1 is made up of three sheet metal pieces assembled together with three rivets. There are three forming dies and two drill jigs considered in the sheet metal design.

The weight for design #1 is .0538 lb each, design #2 weighs .042 lb each. A savings of .0118 lb per part or, .38 lb per ship.

APPROVED R.H. LUDERS — COST ANALYST HERMAN B. BARISH



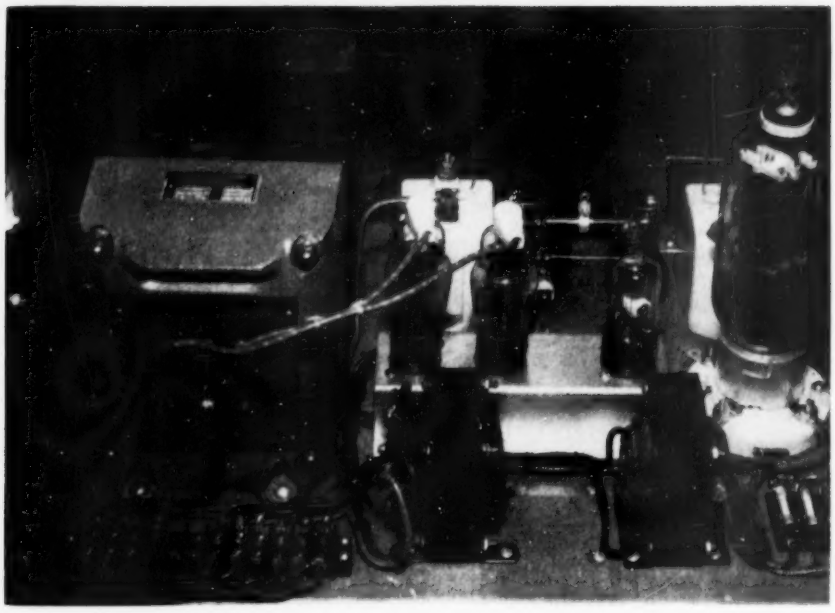
COMPARATIVE COST STUDIES, analyzing the cost of manufacture by various methods, form a basis for design decision

To dramatize this, the production engineering department in Lockheed has set up display cases throughout the engineering division. These illustrate the various manufacturing processes, including sample parts produced by these methods. Explanatory comments are made on background posters. Cost charts comparing the different methods for various quantities of parts produced are included. Management memos and special cost reports circulated to the engineers are also effective means of creating cost consciousness.

The re-education of the engineer along the lines of cost is a must for manufacturers whose product is dependent on design for its economical production and sale.

Because the designer establishes the minimum cost of manufacture through his design, he is a key point in its control. This minimum cost is ideally possible only when the engineer incorporates into his functional design the accepted good practices and principles of manufacturing and tooling. Operational efficiency of the purchasing, tooling and manufacturing departments, together with the effect of design changes, determines how closely the actual costs will approach the designed minimum costs. The correlated and congruous efforts of all divisions of management are necessary for economical production.

As an individual, the engineer must be exposed to the costs involved in manufacturing a product. He must be assisted by those with the know-how in manufacturing and tooling methods and practices. Supplying him with facts and examples is imperative in the designing of economical products.



ELECTRONIC CIRCUIT for ultrasonic cleaning is relatively simple—to an electronics engineer—and incorporates a feedback from the crystal to regulate the generator frequency

ULTRASONICS ... *a sound method of cleaning*

Completely developed into a real production process, ultrasonic cleaning offers important advantages on hard-to-clean, high-unit-cost items where absolute cleanliness is essential

BY RAY E HOMAN, Special Products Section, GENERAL ELECTRIC CO

It is a disconcerting experience to watch thousands of small iron filings line up in a solvent-filled bottle when a magnet is slowly pulled around the outside. That is, it is disconcerting if the solvent has just been used to clean one of your precision aircraft parts that was already as clean as your production methods could make it.

Engineers, foremen, and production men are becoming familiar with this experience as they investigate the use of ultrasonic energy for cleaning high-precision parts. They find ultrasonics can perform a cleaning job of higher quality and in shorter time than conventional cleaning methods, and is being used widely in high-quality precision part production lines. In many cases, ultrasonic cleaning makes the difference between acceptance and rejection in oprating failures on life tests.

General Electric is currently manufacturing one model of ultrasonic generator which has been easily adapted to cover a wide field of cleaning problems. It consists of a cabinet, less than 2 ft square by 3 ft high, containing the electronic equipment. On top of the cabinet is mounted the reservoir which contains a quartz crystal and is to receive the desired cleaner or solvent.

The electronic portion consists of a simple (to an electronic engineer) circuit involving capacitances, inductances, and a power tube. The output of the electronics portion is fed into a tuning coil which is carefully mated to its quartz crystal to provide approximately the correct frequency.

Quartz possesses the property of being "piezoelectric," that is, it will change its physical dimensions as electrical voltage is impressed across it. There are other crystals such as tourmaline and rochelle salt which possess the piezoelectric effect in varying degrees.

In addition to these materials, certain ceramics which are not *naturally* piezoelectric, such as barium titanate, can be polarized by a strong electric field and thus made to behave in somewhat the same manner as a piezoelectric crystal. When these ceramics are overheated, their internal structure becomes random and they lose their piezoelectric properties. This has been a serious limitation to the commercial use of barium titanate, as it is necessary to observe great caution to prevent the crystal from overheating and thus deactivating itself.

Until the last few years, a serious limitation in the widespread application of ultrasonic generating equipment had been that the op-

erator almost had to be an electrical engineer to make the equipment perform satisfactorily.

The generating crystal must be vibrated at its resonant frequency for maximum output. As the resonant frequency varies both with the temperature of the crystal and with the load into which it is operating, the operator was concerned with continually twisting several dials to maintain the proper vibration frequency.

Modern generators utilize a feedback signal from the crystal to the electronic "innards" which tells the generator what frequency it must put out to follow the crystal's resonance. Thus, the former tuning dials have been eliminated and the operator is concerned only with throwing a couple of switches and turning up a power control.

Cleaning takes place in the reservoir on top of the cabinet. This is approximately 4 in. in diameter by 2½ in. deep. In the center of the reservoir's floor is the quartz crystal, mounted so its top face is effectively part of the bottom of the chamber. When the rapidly oscillating voltage from the tuning coil is applied to the crystal, it vibrates with this voltage.

For most cleaning applications the power control is turned for maximum output, as this induces maximum turbulence in the solvent.

When liquid is poured into the tank, tremendous visible agitation is set up by the vibration. As the crystal alternately rams up into the liquid and back again, high- and low-pressure areas are created which travel off through the liquid at the speed of sound. The result is a cataclysmic turmoil which actually drives small droplets up through the top surface of the liquid to a height of several inches.

It is suspected that, in this tremendous agitation, we have an analogous situation to that occurring when we rub our hands together under a water faucet to get them clean. In the case of ultrasonic cleaning, we are "rubbing" the parts a few hundred thousand times per second.

It may well be that cleaning is the result of some phenomenon occurring at the molecular level. Perhaps, in some fashion, the molecular forces which bind the dirt and oil films to the parts are destroyed. We have evidence of this possibility in the fact that thin sheets of metals will, if exposed to an ultrasonic field for a long period of time, become eroded and pitted in the same fashion that a propeller of a ship will become eroded. In the latter case, some scientists believe that the erosion is caused by minute charges of electricity set up by the propeller blades as they churn through the water. It is easy to visualize that the same sort of electrical action is taking place in the violently churning solvent of the ultrasonic generator reservoir.

HIGH-PRODUCTION METHODS

The rapidity with which ultrasonic cleaning takes place has long been counterbalanced by the difficulty in handling small parts However, techniques have now been developed so ultrasonics can, in many cases, be used satisfactorily with large-scale production. One large company is designing complete conveying equipment which can treat batches of small parts by ultrasonics, as well as pass them through a vapor-degreasing phase if desired.

If the parts are extremely small it is often possible to clean them by placing them in a glass beaker filled with solvent and passing the ultrasonic energy through the beaker's bottom to the parts. If the bottom is reasonably thin, the energy lost will not be great enough adversely to affect the result.

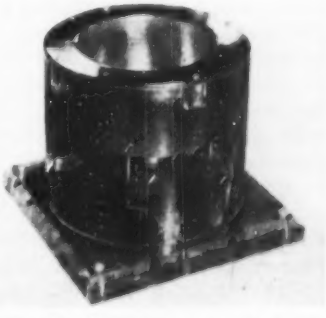
This method is used by Miniature Precision Bearings, Inc, Keene, N H, to clean bearings so small that over 300 can be placed in a thimble. The bearings are spread over the bottom of the beaker and 50 are cleaned in less than 1 min.

ACCESSORY EQUIPMENT

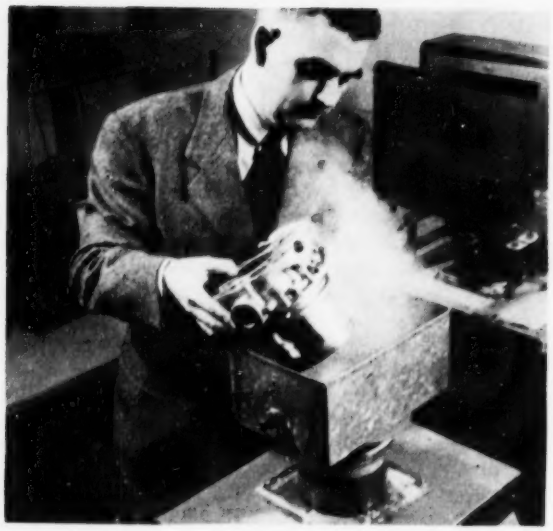
Frequently a customer wants to treat a part too large to fit into the solvent bath. It is a simple matter to make a cleaning tank from galvanized sheet metal that will sit on top of the reservoir. The tank should have a "chimney" on its bottom that fits down into the reservoir, making contact with water placed there instead of solvent. A thin metal diaphragm, made of stainless steel or copper 3½ to 4 or 5 mils thick, covers the bottom of the chimney and enables the user to fill the large tank with solvent. In this manner, ultrasonic energy is transmitted from the quartz crystal, through the water coupling, through the thin metal diaphragm, and into the solvent in the tank.

Although the agitated area is not made larger by this means, it is possible to immerse a large part and, by moving it around, irradiate its entire surface by ultrasonic energy. General Electric Aeronautic and Ordnance Systems Division in Schenectady is using this method to treat a few holes in a jet airplane part approximately 1½ ft square. A tank of this type

ULTRASONIC CLEANING UNIT consists of a cabinet containing the electronic tubes and equipment and the simple, one-dial intensity control. Cleaning reservoir is on top of unit



TRANSDUCER ASSEMBLY is housed in this plastic unit. Reservoir for solvent has thin bottom, and quartz crystal forms a part of the bottom



LARGER UNITS, such as this aluminum casting, can be handled in a sheet-metal bath having a "chimney" immersed in water in the regular reservoir. Vapor is caused by ultrasonic agitation of solvent

MINIATURE BALL BEARINGS are cleaned in a glass beaker placed in the regular reservoir. All components are cleaned after each operation and after assembly at the rate of 50 in less than 1 min

can be made inexpensively with soldered joints every place except the diaphragm joint, which should be brazed or silver soldered.

An accessory which has proven useful is a container which looks something like an ordinary kitchen saucepan, except for a thin metal diaphragm on its bottom. This sits on the top of the reservoir in the same way as the large tank. Its advantage is that when the solvent is dirty it is simple to lift the container off and pour out the solvent. Furthermore, as water is used in the reservoir, solvent can be employed which might normally harm the gasketing material in which the quartz crystal is mounted.

In the last few months, it has become apparent that ultrasonic cleaning and vapor degreasing give excellent results together. By bringing the parts into a vapor bath to remove the heavy contaminant, then bringing it into an ultrasonically agitated portion to accomplish precision cleaning, results can far surpass those obtainable by older cleaning methods. At least one cleaning equipment manufacturer, Topper Equipment Co, Clark Township, Rahway, N J, has a standard line of combined vapor degreasers and ultrasonic generators available. These use a chain drive and are completely automatic, except for hand loading and unloading.

TECHNIQUES

In treating small machined metal parts, many factors determine the ease with which they can be cleaned. If blind holes are present (and any completely plugged hole can be thought of as blind until the plug has been washed out) quickest action will take place if the energy is able to beat into the dirt occupying the hole. At times, careful positioning is needed; at other times, with parts being shaken in a basket, the reverberations and echoes will be so random that the parts are sufficiently irradiated for good results. Holes so small they cannot be seen by the unaided eye, as in certain filament extrusion dies, are ideally cleaned by the ultrasonic method.

In setting a limit on the size of the cleaning tank to be used with the ultrasonic generator, one must understand the directionality of the ultrasonic beam. In essence, there is a beam of sound energy directed up from the quartz crystal, comparable to a beam of light energy emerging from a flashlight. There is little loss of this energy in its upward movement through the solvent. A depth of 18 to 24 in. has worked quite satisfactorily.

Theoretically, the size of the tank is immaterial as long as the depth does not get out of hand. The tank for the jet airplane part cleaned in G E's Schenectady Aeronautic & Ordnance Systems Division is so large that it actually overhangs the generator enclosing case. However, the entire tankful of solvent is not being agitated; agitation is still largely confined to a columnar beam directly above the crystal.

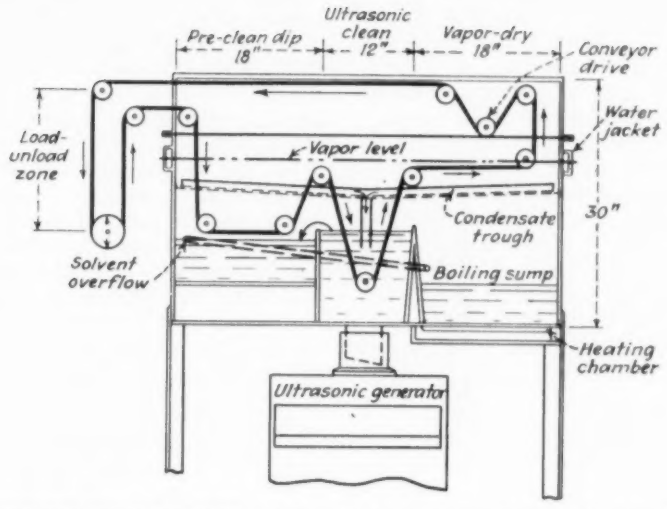
SAFETY

Potential users of any new process are justifiably concerned with the dangers involved for operating personnel. With proper precautions, ultrasonics can be used as safely as other industrial processes.

The worker should definitely avoid putting his fingers into the active ultrasonic energy field in the solvent. The American Medical Association has pointed out that living cells can be adversely affected by prolonged exposure to ultrasonic energy. However, as air is a poor transimtter of the energy, there is no harm in working around the generator, and the operator can work with complete safety by handling the tiny parts with tweezers.

SOLVENTS

For most satisfactory results it



COMBINATION VAPOR DEGREASER and ultrasonic cleaner removes heavy soil by vapor bath, then precision cleans in ultrasonically agitated section. Unit is commercially available

is important that the solvent be carefully chosen. If the solvent alone has no effect on the contaminants, then the addition of ultrasonic energy will not greatly improve the results. However, if the solvent normally has a good effect in removing the soil, the addition of ultrasonics will, in general, tremendously hasten the solvent action and improve the thoroughness of cleaning.

For many industrial oils and greases, trichlorethylene and other chlorinated hydrocarbons give excellent results with ultrasonics. There is an obvious limitation here, however, because the resulting surface is so completely clean there is nothing to protect it from rusting when moisture is present. Unless extraordinary precautions are taken to prevent harmful moisture from coming in contact with the cleaned piece, rusting can cause as much harm as the original contaminant.

To eliminate this, many users have found certain petroleum-base solvents, like varsol, give good results because they leave a protective film on the cleaned surface. Other solvents are various alcohols, members of the trisodium phosphate family, and even water.

The last-named, in many cases, is an excellent solvent; some users have added soaps or detergents to improve its action for their particular appplication. A Long Island manufacturer is using a mild soapy water solution with ultrasonics for removing fine dust and lint from precision - wound potentiometers. Removal of all foreign matter was extremely important because the soil caused electrical noise which could not be tolerated. These potentiometers are now cleaned completely by a quick immersion into the energized area of the solvent.

SUCCESSFUL TECHNIQUES

With the growing use of precision hydraulic control systems for aircraft and gunnery applications it has become extremely important that the various pumps and transmission assemblies of the system be completely clean.

Ordinary methods, using air jets and brushes, simply are not capable of providing the perfect cleanliness desired. Where oil passages wander through castings and intersect other passages, or where a passage ends in a blind spot, there is apt to be much trouble in removing all the grease, metal chips, lapping compound, and lint which can accumulate along the sides.

If it is possible to fill the passage with solvent and beam ultrasonic energy into it, the chances are excellent for removing the contaminants completely and quickly with a big saving in cleaning time.

G E's Aeronautic & Ordnance Systems Division has estimated a saving of over $10,000 in one year in the cleaning of an aluminum gear case housing. There were six holes running into each other which were natural recipients for chips, oil, dust, and process coolant. Several hours were formerly spent in attempting to clean each casting by hand; now they are cleaned within 5 minutes.

Precision ball-bearing manufacturers are faced with a difficult problem in making absolutely certain no foreign matter is left on bearings. A gimbal bearing used in a gyrocompass operation, for example, cannot have anything present which will affect its torque response. A question frequently raised is, "How do you remove the part from the dirty solvent after it has been cleaned, without redepositing the dirt?" One of the most effective ways is to flow the solvent in opposition to the direction of travel of the part. In this manner the part continuously moves from dirty to cleaner solvent and can be safely removed when the clean area has been reached.

Ultrasonic energy is highly directional, like a beam of light. Instead of spreading out like low-frequency sound, it can be beamed or focused. If a piece is placed in the energy area an "acoustic shadow" can result that may prevent subsequent parts or the back side of the interfering piece from receiving the energy. There are several ways to avoid this effect, such as introducing a reflecting surface so the energy will bounce off and hit the shielded back side.

By moving the part so that all of its outside surfaces receive the ultrasonic energy, complete cleaning often results in only a few immersions. A bearing has been cleaned in 30 sec by this method for the Air Force, which had formerly taken 10 min by conventional techniques.

REMOVING FINGERPRINTS

Fingerprints on highly cleaned surfaces have long been a troublesome industrial problem. Spe-

cial solvents are marketed which can be daubed and scrubbed on the contaminated area to remove the offending print. In many cases, however, it has been possible to achieve the result by a quick immersion into an ultrasonically agitated bath.

Dried lapping compound on small parts has also been a headache. It is generally a simple matter to cut the binder with an appropriate solvent, but to remove the small abrasive particles of the lapping compound itself is a different matter. Usually, the tremendous agitation set up in the solvent by the ultrasonic energy has no trouble in doing a completely thorough job of cleaning.

The field of applications for ultrasonic cleaning has grown wider and wider as news of what it can do is spread. The electronics industry is using ultrasonics for cleaning quartz crystals, wires before sealing into tubes, and tube grids and filaments where any trace of contaminant would ruin the device's performance.

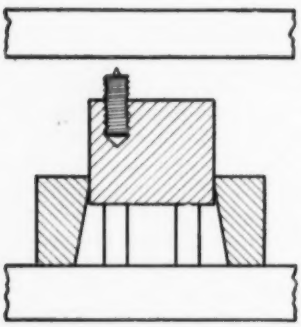
The electrical manufacturing industry finds it invaluable in cleaning high-speed rotors, stator laminations, and small clock bearings.

The aircraft and automotive industries use ultrasonics for cleaning splines, small gears, complex transmission castings, pumps, valve seats, and seals.

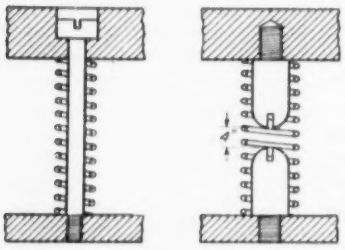
The list includes the makers of jewlery, miscellaneous stampings and machined parts. In general, if parts and complex assemblies have a relatively high unit value, and if it is troublesome to acquire the quality of cleanliness desired, cleaning by ultrasonics may be the answer to the problem.

DIEMAKERS' KINKS

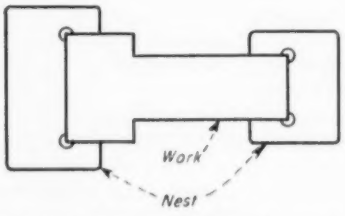
BY FEDERICO STRASSER



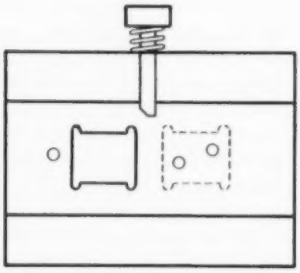
SPECIAL CENTER PUNCHES are helpful to the diemaker, when transferring blind threaded holes. The threaded center pnnches are screwed into the holes to be transferred, the corresponding tool member is brought down and tapped. After removal, the tool member can be drilled and tapped.



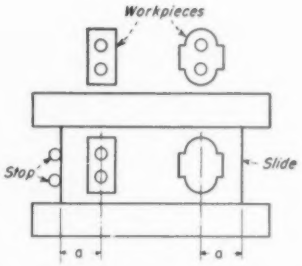
LONG COMPRESSION SPRINGS that actuate strippers or shedders must be guided. If placed around stripper bolts, keep the clearance to about 0.05 in. If springs must be located separately from such bolts, use guide screws with about 0.4-in. distance between their heads in the closed position of the tool.



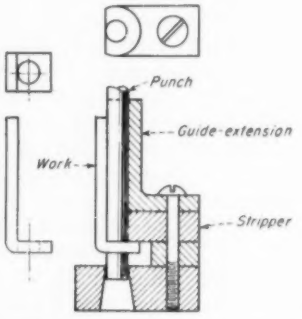
RELIEVE THE CORNERS of work nests in second-operation tools. Thus, any accummulation of dirt or chips will have some place to go and not destroy accuracy of part location.



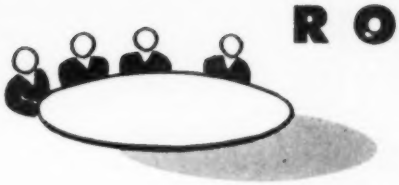
WHEN LAYING OUT a progressive die, the manual starting stops should always be shown pushed into position, to draw attention to their presence.



FOR SECOND-OPERATION piercing dies used to perforate two different pieces, make the slide feed reversible. Dimension "a" between the edge of the slide and the centerline of the work nest must be the same in both cases.



PIERCE HOLES that lie too close to the bend line after the bending operation. If one leg of the formed part is long, make the punch a slide fit in a guide fastened to the stripper.



ROUND TABLE

Salary No Secret

"Whats the big idea in having the fellows classified or rated, Al? I see where Smith goes around as a No. 1 while Tucker rates a 3. How come?"

"Category, my friend, category."

"Category! Are you nuts? Just what do you mean, category?"

"These numbers show how much each man makes, Ed. It will do away with all this secrecy stuff about what a man is making."

"Do you think it's a good idea to advertise what a man is making? Don't you think that'll stir up a hornet's nest?"

"Why should it? More than likely, it'll act as an incentive for a fellow to get a lower number by pitching into do a better job."

"That may sound very fine on paper, Al, but in practice it isn't so good. A man cherishes a little secret like the money he is making. It's his business, not the shop's."

"To me this secrecy business is all wet—ever hear a bunch of wives chit-chatting over a deck of cards? When that bunch of gals get through of an afternoon you can bet your eye teeth that there is nothing left covered up."

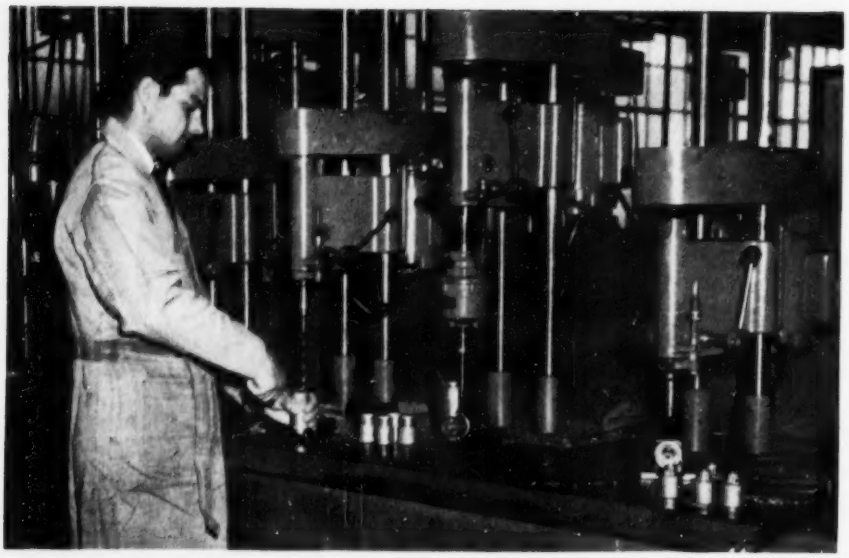
"Oh, I'll admit that some wives do shoot off their mouths at the wrong time, but I don't feel that they are foolish enough to divulge their husband's earnings."

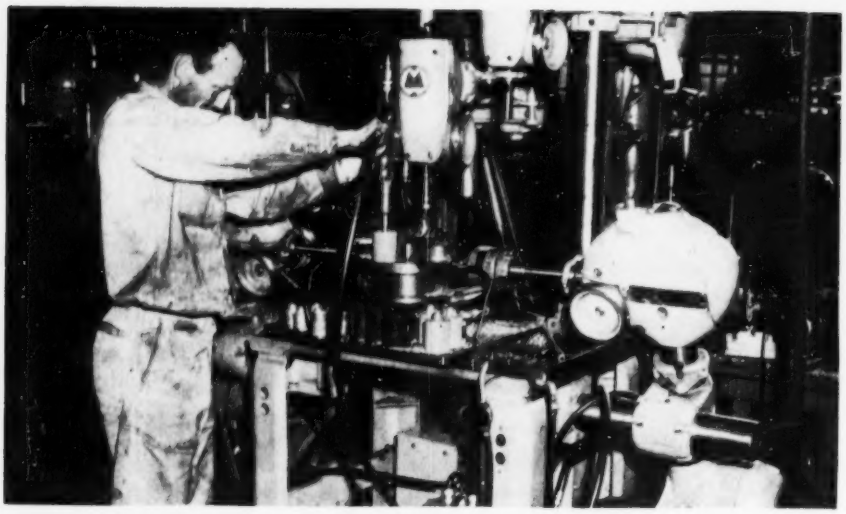
"You'd be surprised! Anyhow, Ed, putting the facts down in black and white will stop a lot of guessing and wasted time snooping into other people's business."

"I think you are heading for the rocks by such a stunt. I know I'd resent flaunting my superiority in another's face and I can imagine how the small-scaler would feel about it. Nah, you'd better let well enough alone and let the fellows do a little worrying about how much the other fellow is making."

"I like the idea of being open and above board about it and let the man enjoy his pride in being superior—let the other guy sweat it out with himself and do a little something to pull himself up a bit."

***DOES PUBLISHING WAGE** rates stop the snooping and prying into other men's financial affairs? Or does it start new troubles? Which is better, open wage rates or secret ones? Your ideas and opinions on this subject will help others. Discussions on earlier subjects appear on later pages.*





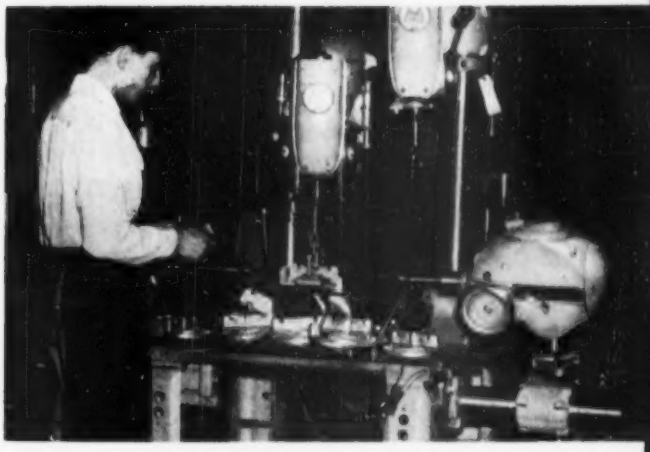
SANDING DRUM is fabricated from casting by drilling a 27 hole, tapping it ¼-20, then tapping cored hole ⅜-16. Old method was three operations with three jigs under three spindles of gang drill. Assembly was handled by separate operator who also packaged the units. New method is one operation in rotary fixture. Operator assembles two drum halves and rubber sleeve, then loads idle station while part in working station is being machined. Old rate—400/day; new rate—1000/day, plus release of assembly time

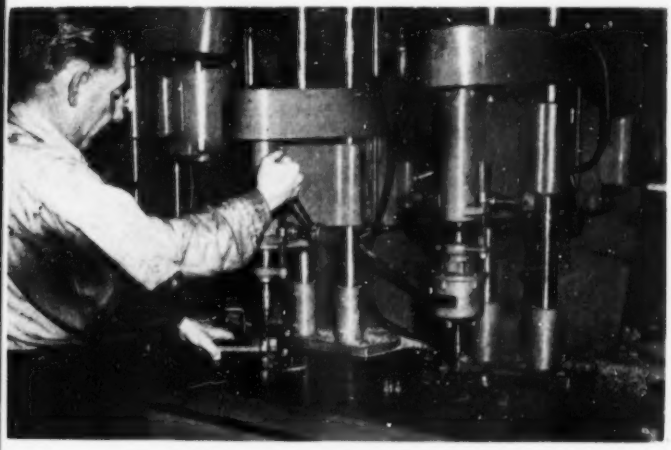
Drill units give a new push to job-lot machining

The plant that makes Magna Drills uses its own products to advantage, as shown in these pictures and captions. Same drillbits, taps, and reamers are used, but the machine setups are different; there are fewer setups for the same production, allowed by the versatility of the new units. More automatic control allows quicker machining and cuts time between actual cutting operations. This is a sample of what can be done with modern equipment and good production engineering

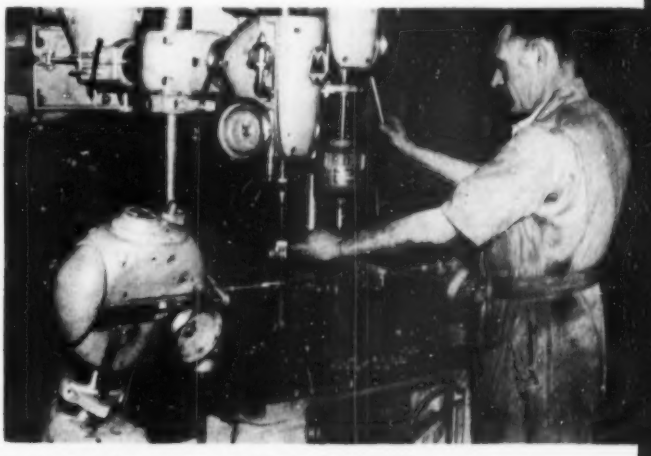
BY PAUL JONES, Magna Drill Project Mgr, PRODUCTION ENGINEERING CO

MITRE GAGE is another casting, drilled for two ¼-in. holes in opposite ends and cored hole tapped ⅜-16. Old method used tumble jig with two spindles of gang drill. New method is single setup in quick-acting jig where three drill units work almost simultaneously. Old rate—30/hr; new rate—80/hr

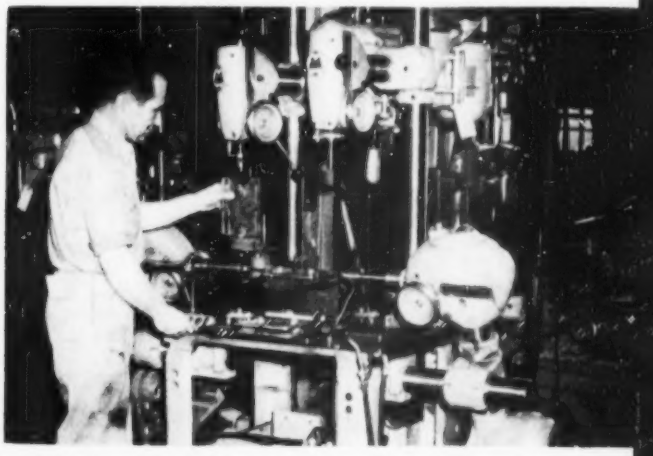


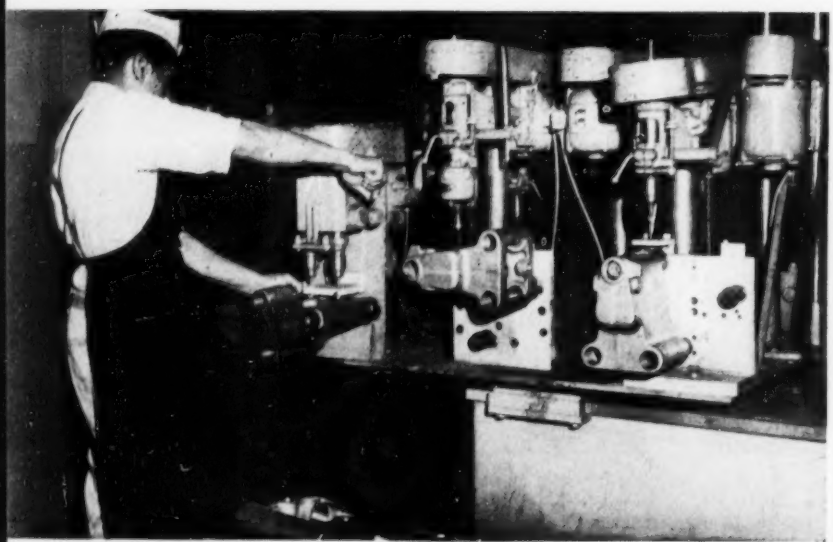


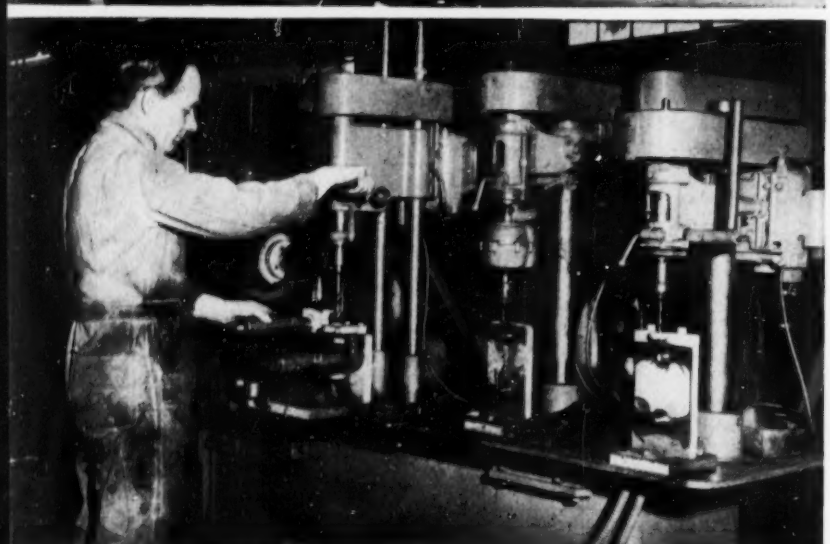
STOP-ROD CLAMP is little part drilled for two ¼-in. holes and two #7 cross holes that intersect the larger holes; then the small holes are tapped ¼-28. Old method called for tumble jig, two drill spindles, then pulling part out of jig and tapping. New setup works with quick-acting jig equipped with three drill units, one with a tapping attachment. Old rate—30/hr. New rate—60/hr

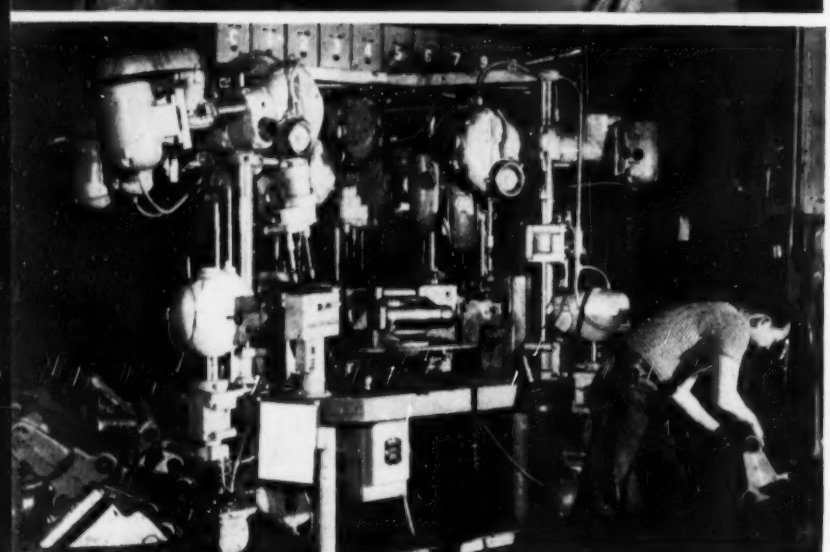


MOTOR BRACKET is drilled 5/16 in. at each end, then tapped ⅜-16. Old setup was without fixture except for angle plate and drill bushing. Part had to be turned end-for-end twice between operations; operator had to move from drill spindle to tapping rig. New method calls for jig that locates part for simultaneous drilling with automatic cycle, two drill units. Operator taps already-drilled part while next is being drilled. Old rate—60/hr; new rate—90/hr









SHOPSMITH HEADSTOCK is a big casting that requires two 5/16-in. holes tapped ¾-16, two #31 holes, and a 23/32-in. clearance hole. Old method took four setups; one (top) locating the part by its finished large bore on a fixture mandrel (drilling), the second a tapping attachment on a station of the gang drill, and the third a double-spindle rig for the small holes. The clearance hole was drilled separately at another fixture and drill (middle). New setup does all this machining in a single setup for drilling, tapping, and reaming, with drillheads controlled from panel switches and work loaded on rotary jig table. Drillhead at left (below) is fitted with double spindle and is at angle to machine two #31 holes. Center station is for loading and unloading. Remaining jobs on the part —two tapped holes and a gage-rod slot—are machined on a Shopsmith head equipped with a Jarvis tapper, and a Barnes drill. Old rate—5/hr; new rate—9/hr

how to make

impact extrusions of high-strength aluminum

BY J D SHOEMAKER, Manufacturing Research
LOCKHEED AIRCRAFT CORP.

Impact extrusion has been applied in the production of several hundred parts at Lockheed Aircraft Corp. This essentially simple production method has saved up to 75% in time as compared to machining, and up to 90% in material. Parts have desirable grain structure and surfaces equivalent to a highly polished finish can be obtained directly from the dies when required. From experimental work by the Engineering Department at Lockheed and development of production tools and methods by Manufacturing Research, this report has been assembled giving a complete account of how to apply impact extrusion to high-strength aluminum alloys.

American Machinist SPECIAL REPORT NO. 339 TO THE METALWORKING INDUSTRIES

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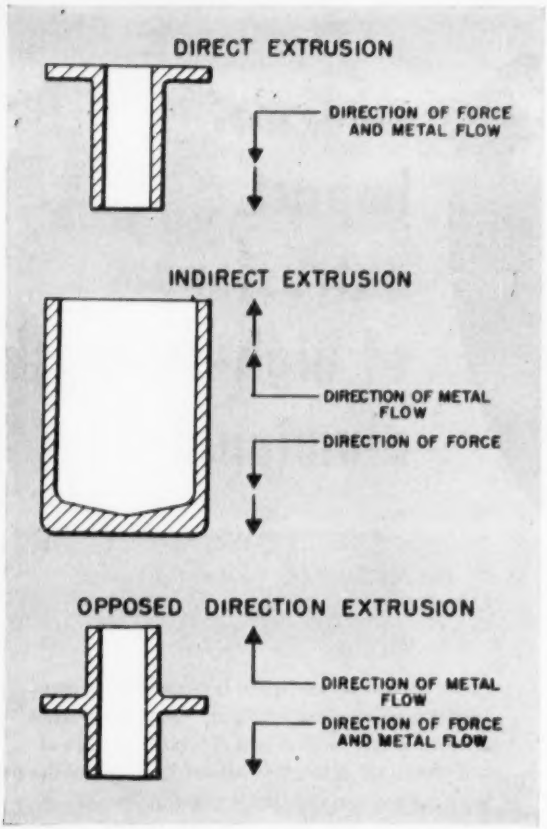
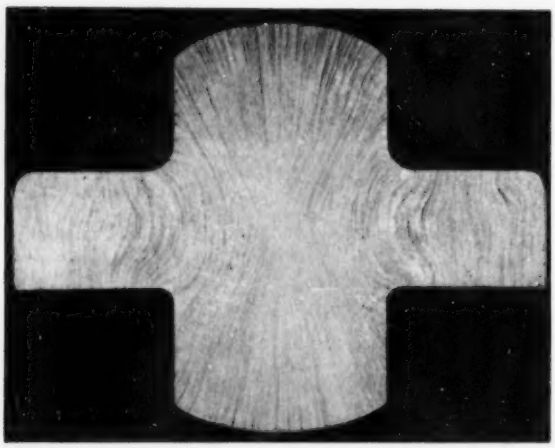


TYPES OF IMPACT EXTRUSION

impact extrusion



METAL FLOW in extrusion of 75S aluminum. This part is formed in a single press stroke by opposed extrusion

Impact extrusions are produced by placing a slug of metal in a die cavity and striking it a high-speed impact blow with a punch. The die cavity is designed to the same dimensions and shape as the outside of the desired part and the punch is designed to the same shape and size as the inside of the finished part. The impact causes the metal to fill the die cavity and to flow or squirt upwards or downwards around the punch depending upon the type of extrusion wanted.

Speed is the essential characteristic of this method of cold working metal. The time required to produce a complete extrusion is measured in fractions of a second.

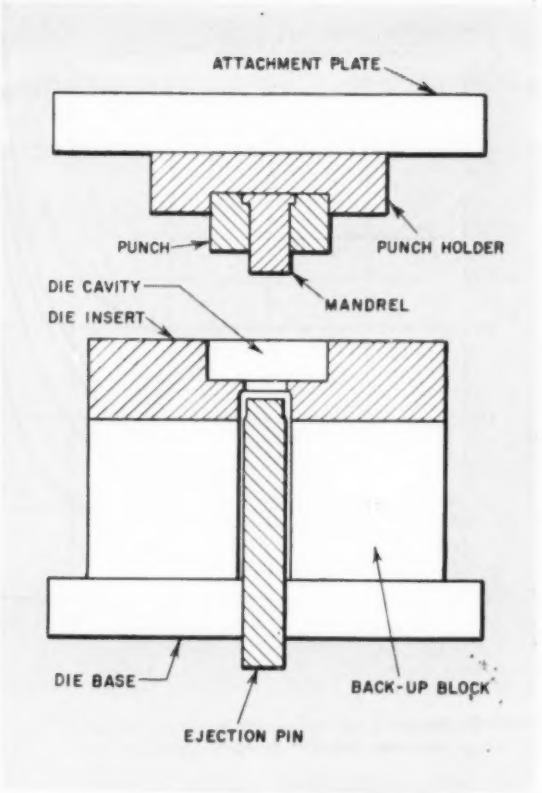
There are three general types of impact extrusions:

1. **Direct extrusion,** where the flow of metal is in the same direction as the applied force. This requires a closed type of die.

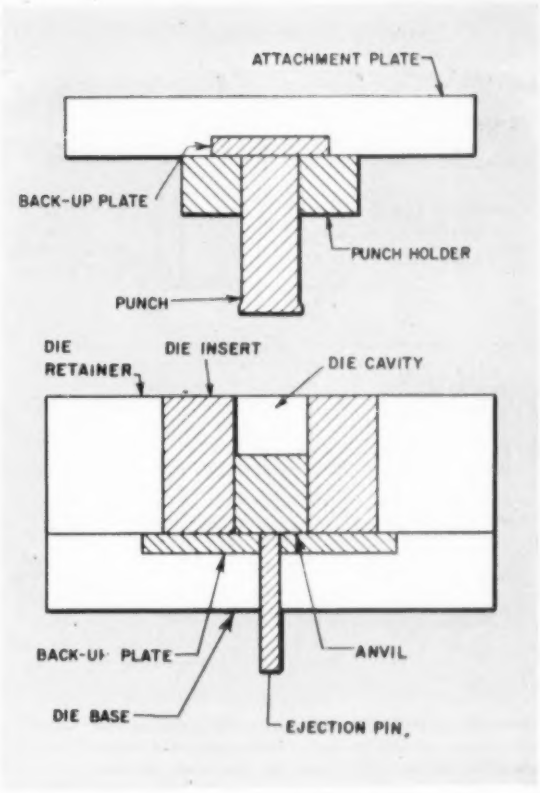
2. **Indirect extrusion,** where the flow of metal is opposite to the direction of applied force. This requires an open type of die.

3. **Opposed extrusion,** where the metal is forced to flow simultaneously with and opposite to the direction of applied force. This requires a combination die incorporating features of both direct and indirect extrusion components.

Thus far, all production development at Lockheed has been for designs employing symmetrical cross sections. However, it is possible to extrude parts of non-symmetrical cross-sections in a limited category of shapes.



FORWARD EXTRUSION DIE — considerable variation in design is possible to suit part shape, size, alloy, percentage reduction, and pressure factor of the work. However, this general arrangement represents the minimum number of punch and die components



REVERSE EXTRUSION DIE — again showing the general arrangement of minimum number of component parts. Actual design will vary with the same factors as those influencing forward extrusion dies

tool design and construction

Generally, dies for impact extrusion of high-strength aluminum alloys must be designed to withstand high static pressures caused by plastic deformation of the aluminum alloy material, impact, fatigue, friction between the work and die surfaces, and high instantaneous heat transfers. Working stresses involved in the dies combine tension, compression, and shear forces under shock loading.

Working surfaces of dies must have the finest possible degree of finish to minimize working friction and to prevent galling and pick-up caused by the extremely concentrated pressures and high velocities required.

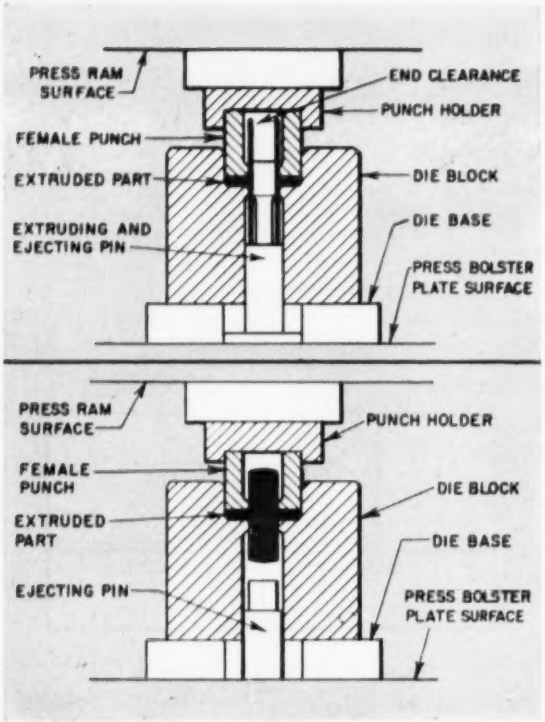
Extreme care in machining, grinding, and polishing is necessary to prolong life. Die components, such as punches and die cavities, that are scored by machining or checked from grinding cannot be used. These defects act as stress risers and will likely cause failure before many blows have been struck.

Care must also be exercised in heat treatment, quenching, and drawing operations for punch and die components to obtain correct hardness and eliminate heat-treat cracks. Punch and die cavity components that contain heat-treat cracks, no matter how small, in or near the working surfaces, fail in operation.

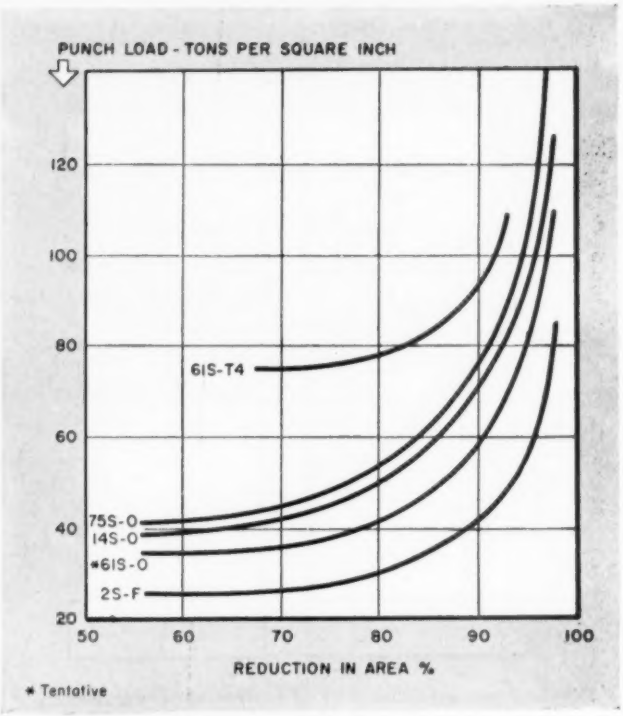
DIE MATERIALS

Various types of tool steels have been tested in both experimental and production dies. The following recommendations are based on steels we are now using in production dies.

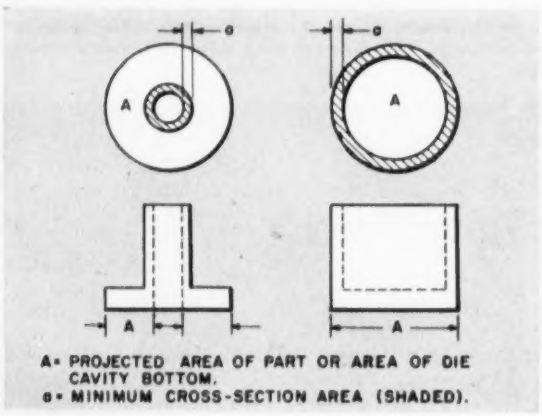
Punch should be an air-hardening high-carbon, high-chromium tool steel (class A-1) such as Ontario or Lehigh H or a graphitic tool steel such as Graphtung. The punch is hardened to 58 to 60 R.



OPPOSED EXTRUSION DIE — Typical arrangement for components of dies to form flanged opposed extrusions for tubular parts (top) and bar parts (bottom)



EXTRUSION PRESSURE for various aluminum alloys based on reduction in area



EXAMPLES of how areas are determined for the formula 100 X (1 — a/A) which gives the percentage of reduction in area

A high polish is required on the extruding surfaces —5 mu-in. rms or better. The recessed area back of the extruding land does not require polishing—a smooth, ground finish is adequate.

Punch holder can be any good grade of steel that can be hardened to 36 to 40 R_c.

Backup plate should be a shock-resisting tool steel of the chromium-tungsten type such as Semiole or the high-silicon-manganese type such as Omega. It is hardened to 46 to 50 R_c.

Attachment plate may be made from 4130, 8630, 4140 or equivalent steels hardened to 36 to 40 R_c.

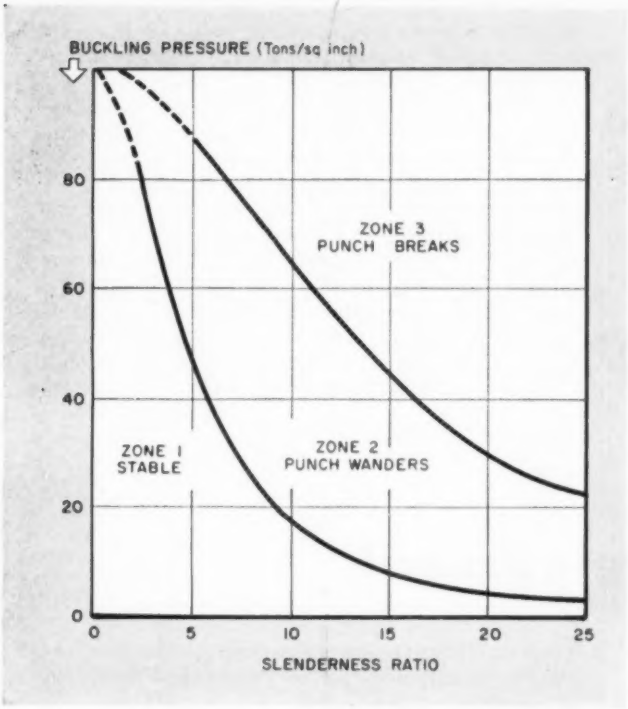
Die cavity or insert should be a tungsten-chrome type such as Ludlum 593 or a graphitic tool steel such as Graphtung hardened to 56 to 58 R_c. The cavity should be bore quenched to increase compressive stresses. A high polish is required on extruding surfaces—5 mu-in. rms or better.

Anvil should be made from a shock-resisting, oil-hardening steel of the chromium-tungsten type such as Seminole. It is hardened to 56-60 R_c. It is finish ground all over and polished on the top surface only to 5 mu-in. rms or better.

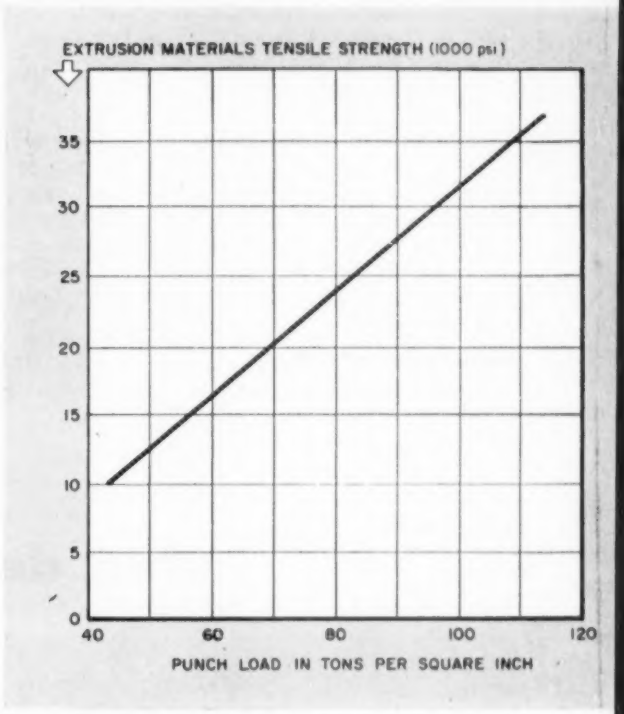
Stress rings are made of 4140, 4130, or equivalent steels. Average hardness is 36 to 44 R_c, depending on stress requirements.

PRESSURE FACTORS

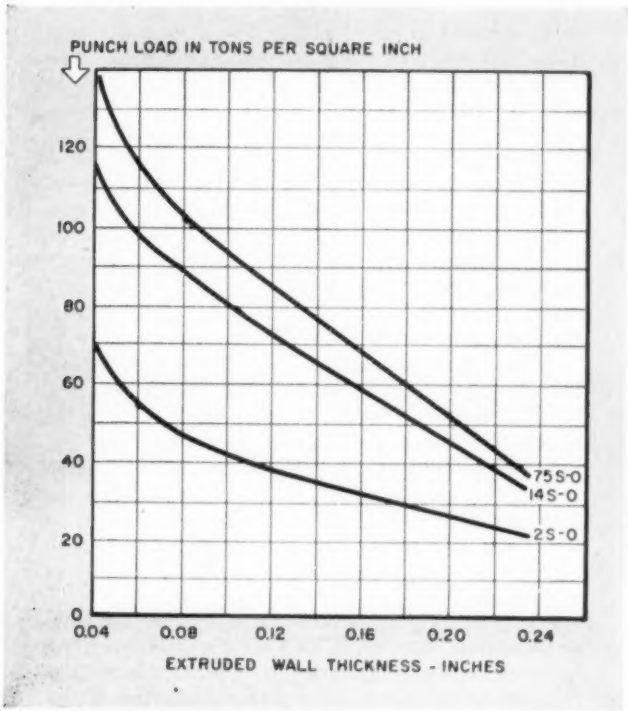
There are two factors used in determining the percentage of reduction in a given part, namely the projected part or blank (A in equation page 134)



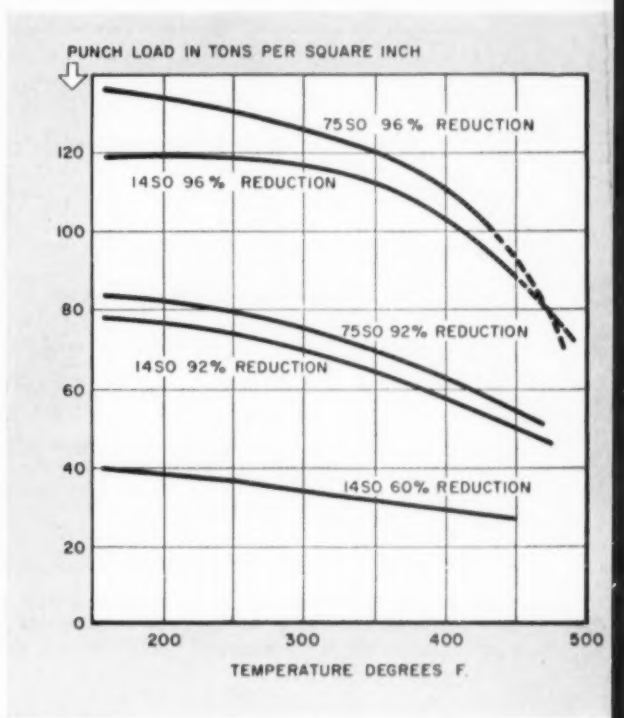
SLENDERNESS RATIO (punch length divided by punch diameter) is the controlling factor in designing punches for backward extrusion



TENSILE STRENGTH of alloy extruded influences pressures required on the punch



WALL THICKNESS of the extruded part has increasing effect on punch pressure required as wall becomes thinner. These data are based on parts with different reductions in area



PERCENT REDUCTION in area and temperature of the slug have a marked effect on the punch load for different aluminum alloys. Preheating to 300 to 500 F is usual with alloy 75S

and the minimum cross-sectional area of the finished part (a in equation below). These two factors are expressed in the equation:

$$100 \times \left(1 - \frac{a}{A}\right)$$

which will give the percentage of reduction in area.

When the percentage of reduction in area is known, the required pressure or punch load, in tons per square inch, may be taken from the chart. Generally, as the percentage of reduction in area increases, the part becomes harder to extrude and, above an 80% reduction, the required tonnage increases sharply.

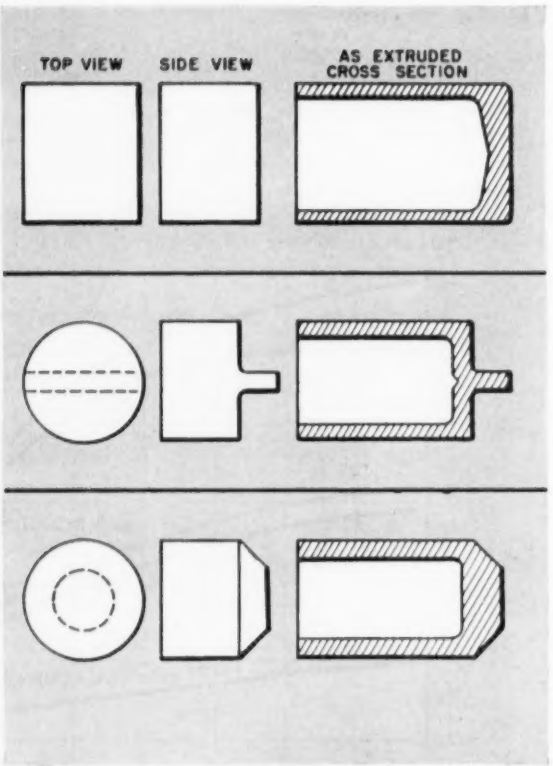
MATERIAL INSPECTION

To eliminate the possibility of using defective materials, all steel forgings, bar, and plate stock from which punches or die inserts are to be made should be thoroughly inspected before any machining operations are performed.

This inspection is best accomplished with an ultrasonic device. At Lockheed we use a Magnaflux Sonizon which will show up cracks, porosity, folds, and voids which may exist inside the steel.

After heat treatment and before assembly, the finished punch or die should be subjected to a standard Magnaflux inspection to show up any defects such as grinding checks or cracks resulting from heat treatment and quenching. A critical analysis of any material defects disclosed may show the nature and location of the defect is not serious enough to discard the material.

slug development



SLUGS for reverse extrusion and parts produced from them show how slug design is influenced by the shape desired in the part

Slugs or blanks are generally developed by computing the volume of metal in the finished extrusion and translating this volume into a solid piece of metal to fit within the die cavity.

REVERSE EXTRUSION

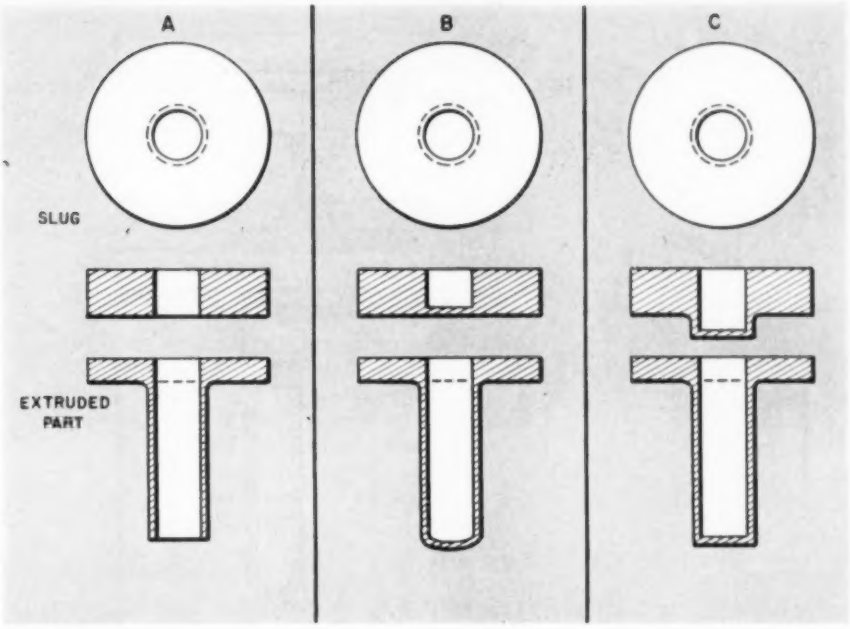
In actual practice, this procedure may be safely followed for reverse types of extrusion, provided a small amount of extra metal is added to the slug mass to allow for irregularities in extrusion flow and material and die tolerances, but the final shape and size of the slug can only be accurately determined by physically testing in the completed die.

Tolerances on slug length dimensions for reverse extrusions should not be greater than + 0.030 – 0.000 in on the final developed dimensions. Punch-length and part-length tolerances are the determining factors for slug-length tolerances and the die-cavity diameter governs slug-diameter tolerances.

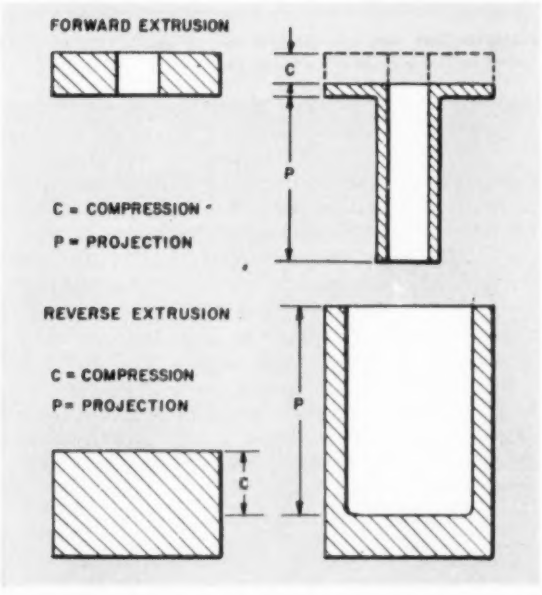
FORWARD EXTRUSION

In the design of slugs for direct types of extrusions, consideration must be given to punch and die extruding land surfaces, flange thickness, type of bottom and thickness, length of projection, part design tolerances, and what may be called "projection ratio." The projection ratio is the ratio between the amount of material required to be compressed in the flange to produce a given length of projection into the bottom die cavity. This ratio may be expressed as P/C.

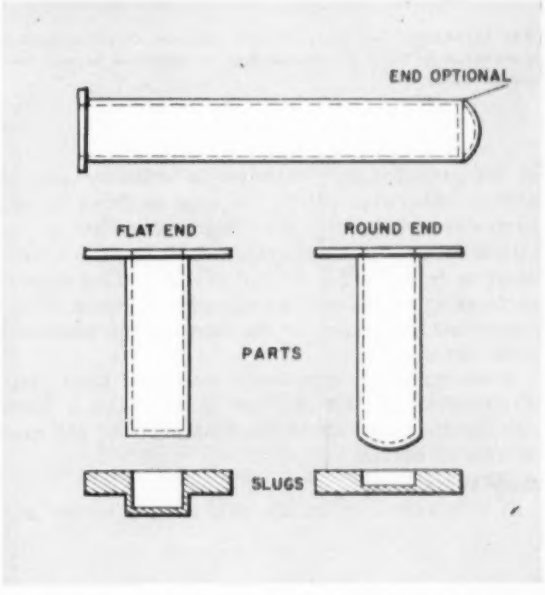
It is extremely important that the projection ratio be accurately determined as it is the main controlling factor in establishing machining tolerances for slugs in order to produce parts within engineering design tolerances. For example, if an extrusion has a projection ratio of 1:32, it is clear that a variation of +0.004 in. in flange thickness of the slug will



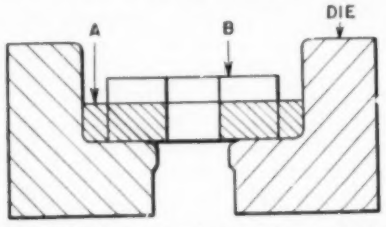
THREE DIFFERENT PARTS from the same die can be produced by varying slug design for forward extrusion



PROJECTION RATIO of an extrusion is the amount of compression required in the flange to produce a given projection in the part. Expressed as P/C, it is shown for forward and reverse extrusion



OPTIONAL ENDS may be permitted on tubular parts as shown at top. The rounded end is more economical to extrude because it requires less machining of the slug and permits a shorter punch



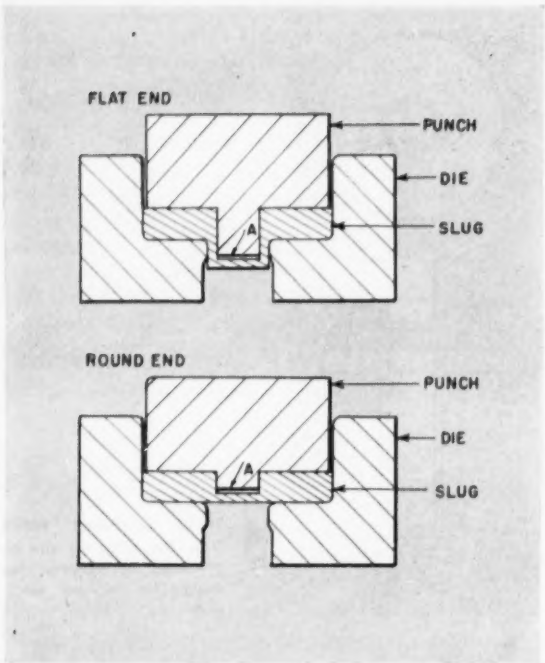
LOW-PRESSURE SLUG *B* can be substituted for standard slug *A* to reduce pressure required. A longer punch mandrel is needed to project through the thicker slug

produce an over-all part length variation of ±0.128 in. at the same punch and die setting.

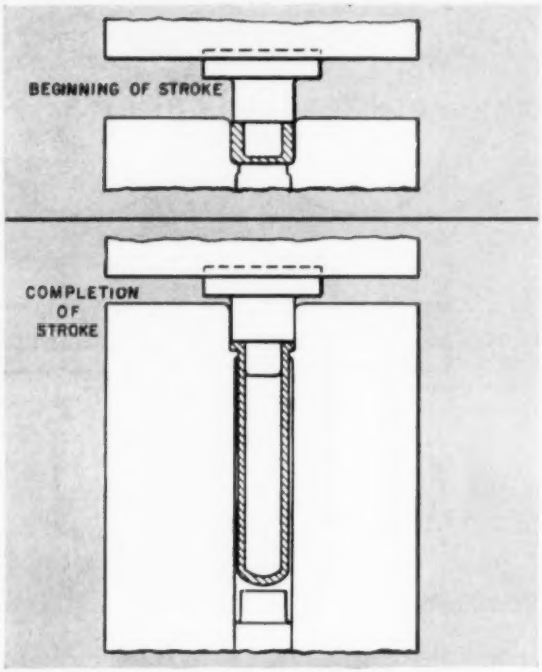
Tolerances on slug dimensions are critical and must be developed for each type and size of part in order to hold parts within part-design tolerances.

SURFACE FINISH

Surface condition of slugs should be as smooth as possible in order to produce the best possible finish



GAP CLEARANCE between punch end and slug should be held to a maximum of 0.010 in. whether flat- or round-end flanged tubes are extruded



FLANGED TUBE with rounded end can be extruded by this slug, punch, and die combination

on the extruded part. However, it is unnecessary to buff or otherwise polish the slug surfaces as the part will pick up whatever degree of polish is obtained on the die cavity surfaces. A smooth machine finish or equivalent is all that is required for the cut surfaces and a normal "as extruded" surface, without defects is adequate for the sides of slugs machined from extruded bar.

When slugs are completely machined from plate or extruded bar, all surfaces should have a finish comparable to a smooth machine finish of 150 mu-in. rms or better.

SLUG VARIATION

It is possible to reduce extruding pressure and initial punch load on forward extrusions by decreasing the slug diameter and making a corresponding increase in the slug flange thickness while maintaining the same volume of metal in the slug. This allows the punch load to build up gradually until die cavity is filled. Filling of the die cavity also has a pre-heating effect on the slug because of the metal flow prior to actual extrusion.

When making this change from a standard slug to a low-pressure slug in order to reduce required extrusion pressure, a longer punch mandrel is required to project through the increased slug thickness. Low-pressure slugs may be used only on open- or closed-end flanged tubular parts.

lubrication

Lubricants for impact extrusions must have high film-strength and flash points from 500 F up because of the high frictional heats generated during extrusion. Animal-fat base lubricant including Degras, lanolin, and lard oils, or compounds containing them, have proven most satisfactory and most universal in application.

Some types of waxes are useable also, but are not recommended for cold impact extrusion because of excessive pickup which galls surface finish of part and residual wax remaining on the punch and in the die cavity which congeals after the part is extruded and inhibits the operation of the ejection mechanism. If waxes are used, the punch and the die cavity must be thoroughly cleaned after each part has been extruded to remove excessive pickup and wax.

APPLICATION

For most slugs, a thin, uniform film of lubricant approximately 0.0005 to 0.0015 in. thick, is all that

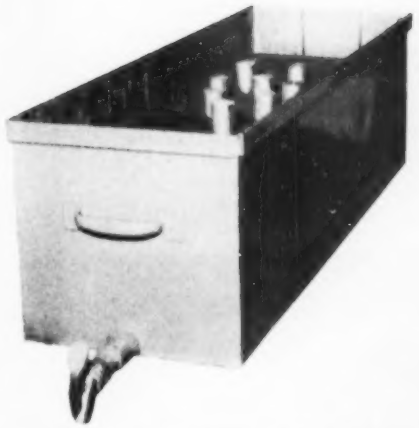
is needed. Film thickness of lubricants required will vary with the shape, size, and type of extrusion and can only be accurately determined by experiment when the dies are first tested in the press.

Lubricants may be applied to slugs by brushing, wiping, dipping, or spraying. Normally they are received in the form of grease or heavy oil and diluted to the proper consistency with volatile solvents such as toluene, trichlorethylene, or carbontetrachloride. The solvent should be allowed to evaporate out of the lubricant before the slug is placed in die cavity for extruding. The film of lubricant remaining on the slug after solvent has evaporated will be found desirably thin and of uniform thickness.

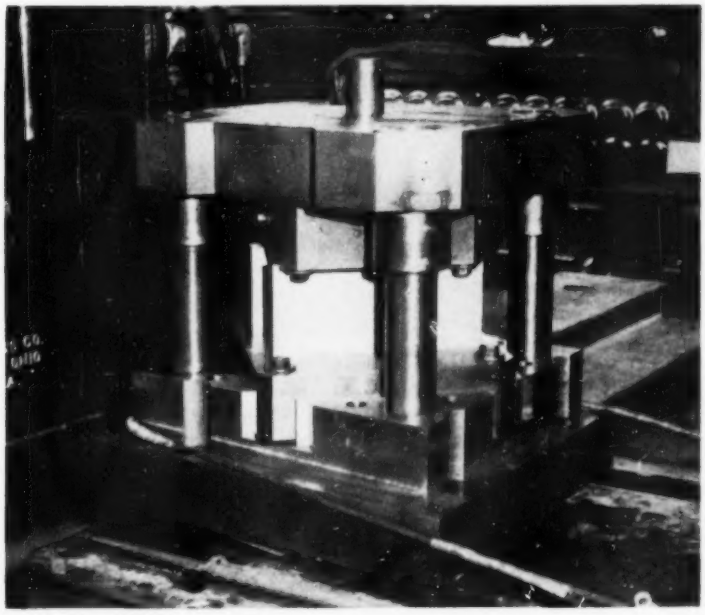
When pre-heating of slugs is necessary, they may be dipped in lubricant just before insertion in die cavity or the punch and die cavity only may be lubricated; the same results can be obtained as if the slug were pre-lubricated.

PROCESS LUBRICATING

In process lubrication (Bonderite), the lubricant is applied to the slugs by immersion in heated solutions. Uniformity of lubricant film over all surfaces of the slug, is obtained by close control of solution strength, time, and temperature.



TANK for pre-lubricating small slugs. Type of lubricant required will depend on the amount of heat generated during extrusion



UNIVERSAL DIE HOLDER for extrusion dies is loaded into press. Holder is handled by a die loader

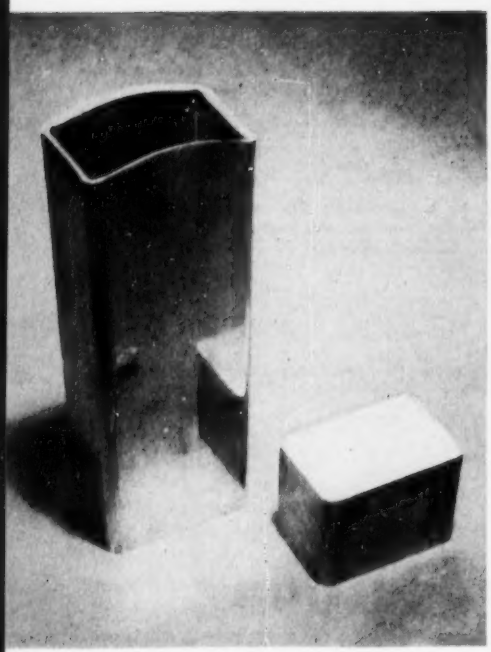
production

Crank presses for impact extrusion must have sufficient bed strength to resist deflection. Even with proper equipment the press adjustment must be checked periodically if good performance is expected.

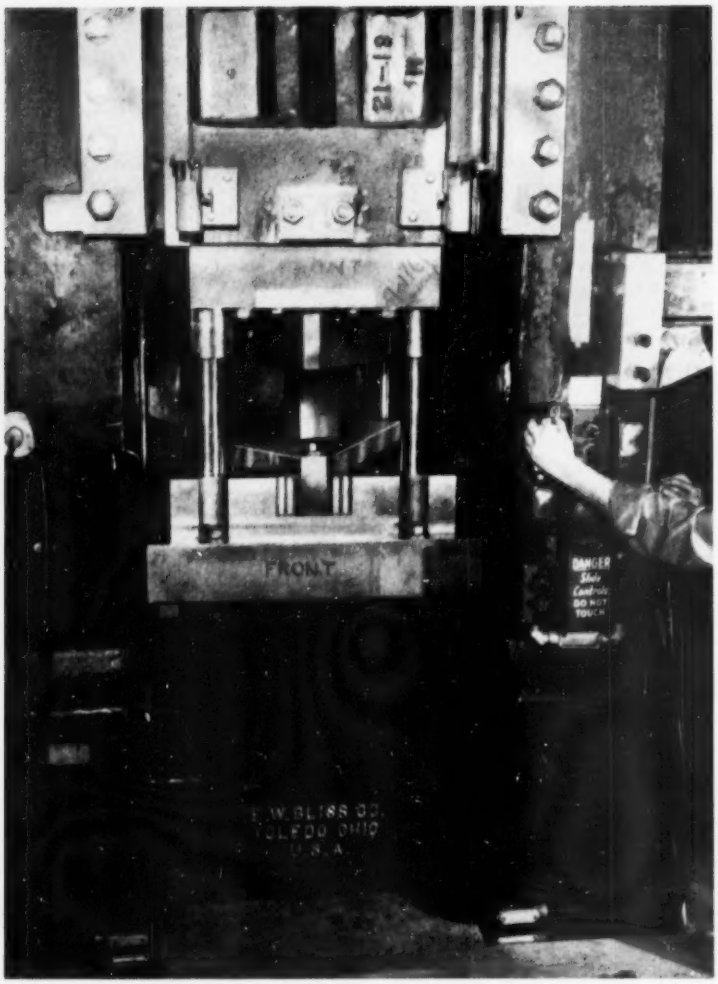
There must be positive parallel alignment between ram surface and bed or bolster-plate surfaces. Also there must be the tightest possible free adjustment between slide and ways to avoid wobble of the ram. Too much looseness in either of these adjustments can cause defective parts and die breakage.

DIE INSTALLATION

Before installing punch and die, the surfaces of the press ram and bolster plate are inspected and chips and burrs, removed in the area the die shoe will occupy. After the punch and die shoes are clamped in place, the vertical alignment of punch, die, and guide pins is thoroughly checked.



BOX EXTRUDED from 14S aluminum. Extrusion has a wall thickness of 0.187 in. Operation is shown at right



DIE FOR BOX EXTRUSION is mounted in 1000-ton No. 513 Bliss crank press. The press is shown here in operation in closed position

Don't allow the punch to strike to full depth on the first blow. The first part should only be extruded far enough to eject from the die cavity. Punch travel for each succeeding part should be increased about 20% for each hit until correct stroke depth is reached. This will disclose the extrusion flow characteristics necessary to develop final slug dimensions and tolerances.

If the part cannot be fully extruded when the die is closed on stop pins or plate, the stops must be removed and the ram stroke adjusted to required depth. If this is done, the die must not be allowed to close unless the slug is in position in the die cavity, or the punch might strike the bottom of the cavity, seriously damaging the punch and die.

OPERATION

At Lockheed the operating procedure is:

1. Inspect slugs to see that all chips and burrs are removed before extruding.

2. Lubricate slugs in proper manner with lubricant specified for each job.

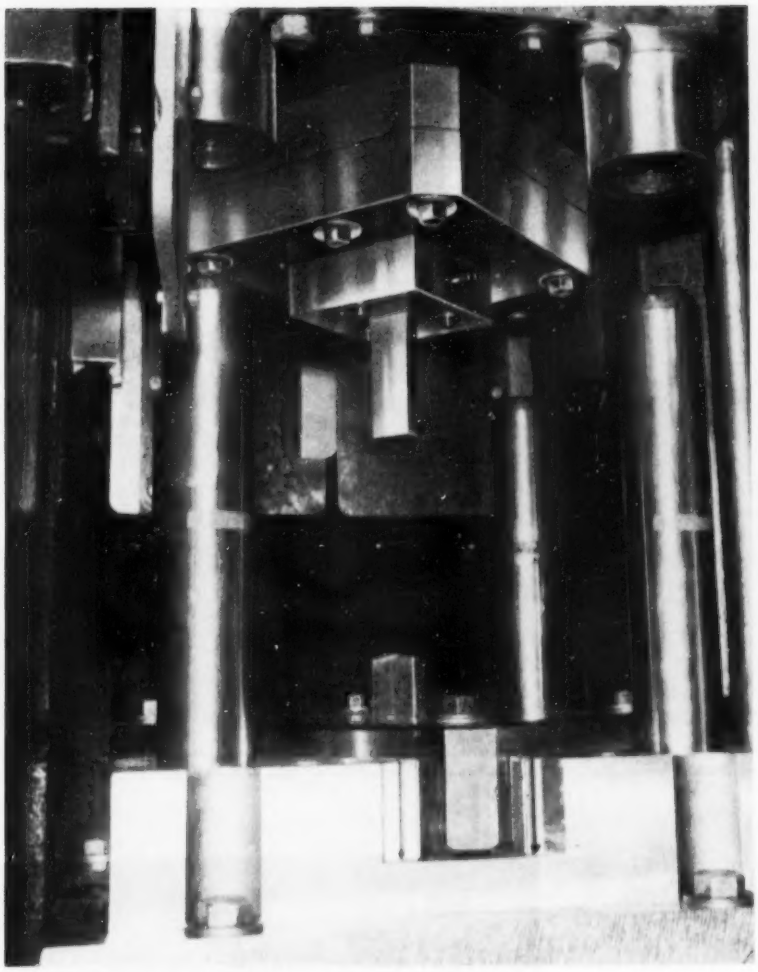
3. Inspect punch and die cavity to be sure they are clean.

4. Check the ejection pin and be sure it has bottomed before placing slug in die cavity.

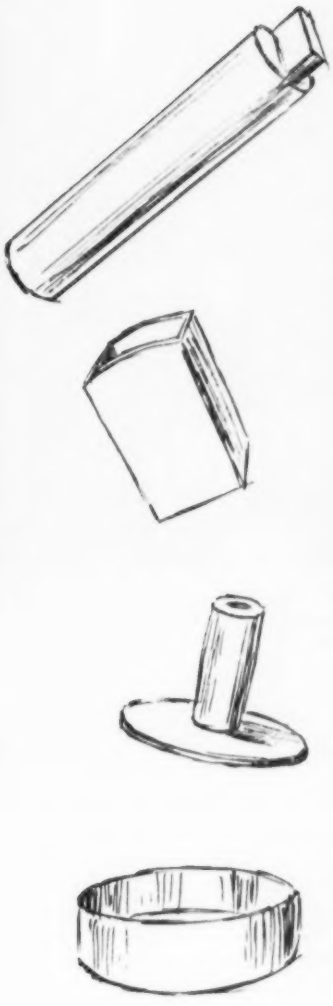
5. Place slug in center of die cavity—especially important for reverse extruding.

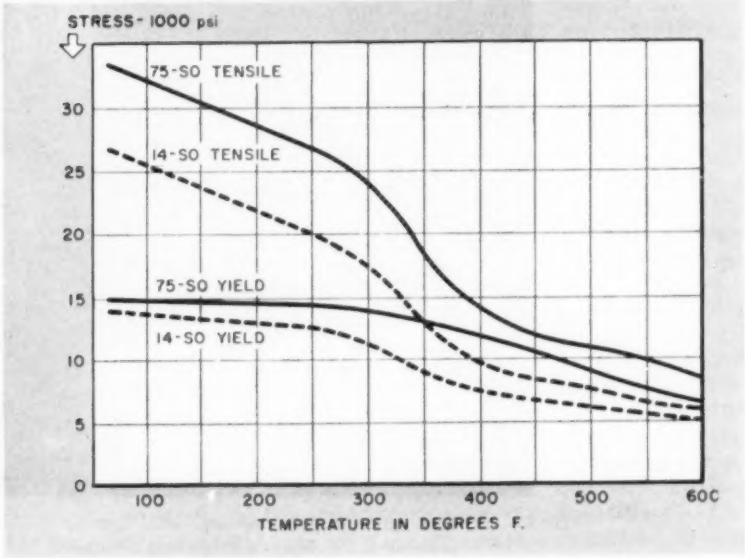
6. Inspect die cavity and punch after each part has been extruded, removing all excessive lubricant and flash pickup. If pickup will not come off by wiping with a shop towel, it can be removed with crocus cloth. Coarser abrasives than crocus cloth will damage the polished surfaces of the punch and die extruding lands.

If a part sticks in the cavity or on the punch, take care not to damage the punch or die in removing it. The causes of parts sticking on the punch have been traced to one or more of the conditions listed on page 140.

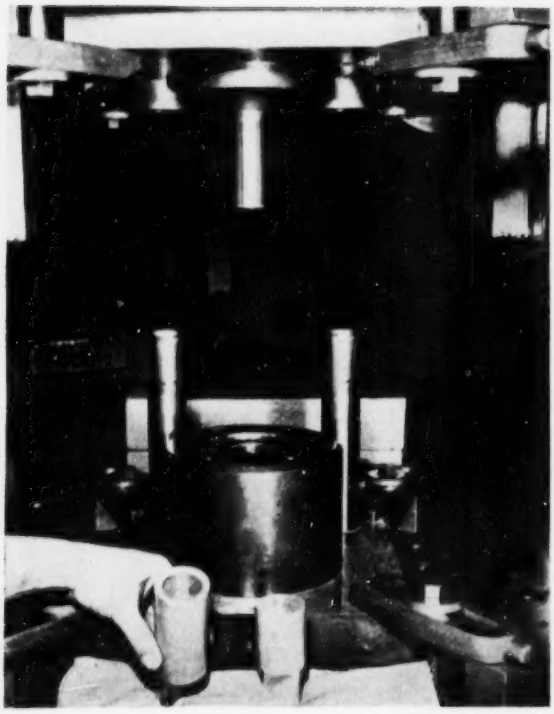


IMMEDIATELY AFTER EXTRUSION, die is shown as ram has lifted and hydraulic ejector has pushed extruded box out of die





ELEVATED TEMPERATURES applied to slugs of 14S and 75S aluminum in the annealed condition will reduce tensile and yield properties as shown



DIE, SLUG, AND EXTRUDED PART of 61S aluminum alloy. Die is mounted in 190-ton No. 40-7 Minster crank press with pneumatic ejector

THIN-WALLED TUBE with closed end is extruded from 2S aluminum in this die. Wall thickness of tube is 0.016 in.

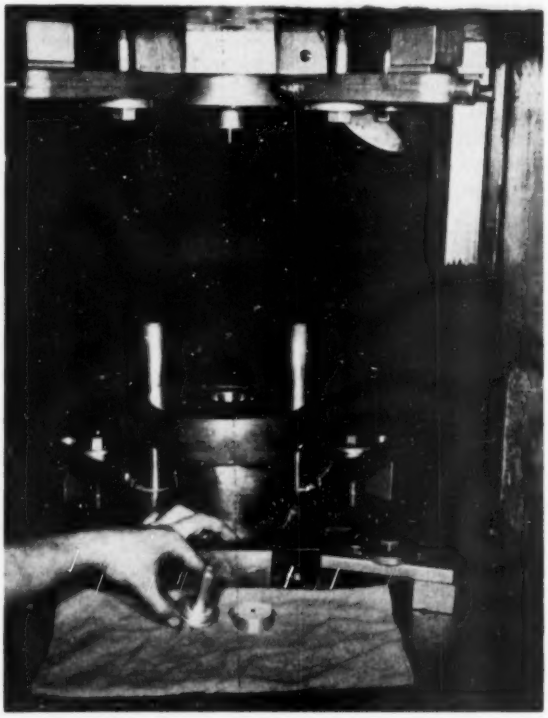
1. Punch galled or polish dulled.
2. Excessive pickup on punch extruding land.
3. Insufficient surface tension in die cavity.
4. Improper use of lubricant.
5. Wrong type of lubricant.
6. Punch temperature too high. Temperature should be kept below 150 F.
7. Punch designed with too much or too little land area.

PRE-HEATING SLUGS

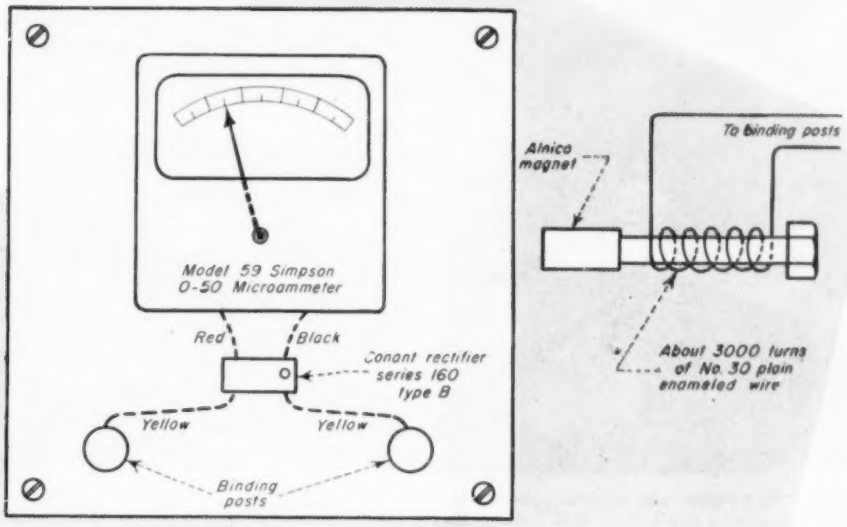
Pre-heating slugs is advantageous and desirable to bring extruded parts within capacity of equipment when the force required for cold extrusion exceeds that of equipment. It will also increase the life of punch and die components by the reduction of forces and consequent effect on fatigue strength of tools.

The amount of force reduction per degrees of temperature may be estimated from the chart. The slug only is pre-heated immediately before placing in die cavity; the punch and die are used cold.

Slug temperature should be held to a maximum of 500 F for use in cold dies. Above 500 F serious defects occur, such as cracking, tearing, and melting. The greatest effect of tensile reduction by preheating is obtained on the alloys 75S and 14S.



FLANGED TUBE extrusion with thick wall is produced in 61S aluminum by forward extrusion



How to measure machine-tool vibration

BY SAMUEL HELLER, PE, Chief Engineer, AMERICAN RECTIFIER CORP, New York, NY

It was necessary to eliminate as much vibration as possible from a small, high-speed, toolroom lathe. For ordinary work, the amount of vibration seemed negligible, but the actual degree of vibration could not be measured. As unbalance and vibration are accentuated at high speeds, the lathe was checked at its highest operating speed, unfastened but leveled, and this speed was noted.

An indicating head was made by winding several thousand turns of a fine enameled wire around a small hexagon-head capscrew. The capscrew was magnetized by attaching a piece of alnico magnet to one end (the threaded end) with adhesive material. The screw was rigidly attached to a toolholder inserted into a toolpost. The two leads of the coil were fed directly into the Y axis of an oscilloscope. A piece of round ers stock was placed in the 3-jaw universal chuck and indicated with a dial indicator. The runout was noted. The lathe was run and the wave height on the scope was measured when the magnetized head was nearly touching the rotating stock—a "feeler" paper was used, thus this height of wave equalled the amount of runout indicated at this speed. The piece was turned and indicated, reading about zero on a 0.0001-in. indicator. The turning had been done at a much lower speed. Then the top speed was tried again and scope deflection was noted. If there is no bed vibration or headstock vibration only a straight line appears on the scope. However, any deflection, between the head in the toolpost and the work, caused by bed distortion, belt slap, out-of-balance headstock, etc, will be shown.

Some plants have no scope but the same method can be used by direct application of the head to a microammeter and rectifier unit as shown. This whole unit sells for less than $20; requires only ½ hr of labor. The meter indicates peak volts and, although not quite as sensitive as the scope, its sensitivity can be increased in several ways: 1. Increase the number of turns on the head, but take into account several factors such as resistance of wire. 2. Increase magnet strength or, better still, wind directly on a long bar magnet and wind only one half. The sensitivity of this device is truly amazing, variations of 0.0001 in. are easily seen.

The readings of the meter unit should be interpreted. Because a sine wave is being developed and rectified, slow speed generates a much lower average voltage and the meter swings a great deal, causing a lower reading. If the same deflection, say 0.001 in., is measured at a higher speed, the average voltage is higher, less swing is noted, and a higher reading is obtained. The proximity of the head to the work has a similar effect.

However, the extreme simplicity of the unit and its low cost make this technique available to anyone having a problem of vibration or distortion. This head can be used for testing all kinds of deflections and vibrations.

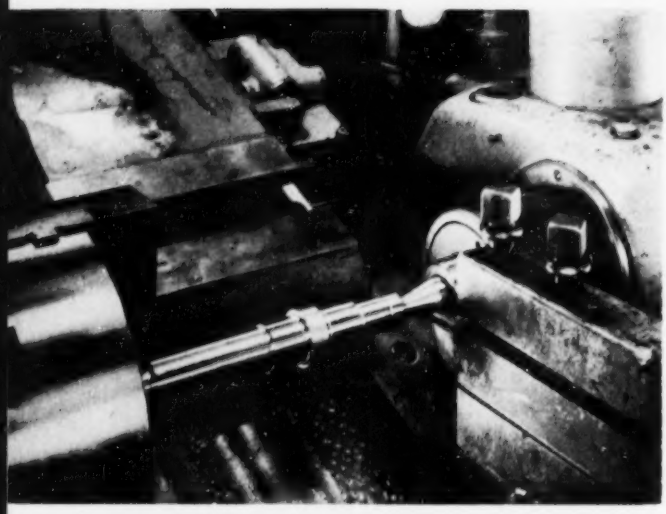


FIG. 1 . . HIGH-VELOCITY TURNING may be done accurately on a production basis if the machine has a front slide with air-gage tracer control

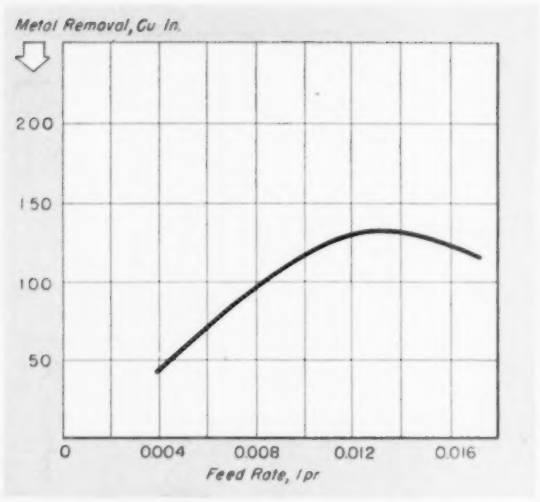


FIG 2 . . FEED RATE vs TOOL-LIFE curves usually reveal a critical point or maximum (in this case 0.013 ipr). The production-minded engineer will usually select a feed rate beyond the crest, say at 0.015 or 0.016 ipr, if the tool life is consistent with desired tool-change periods

Practical approach to optimum machining ..IV

PRODUCTION RESULTS PROVE VALUE

BY A B ALBRECHT, Metallurgical Engineer, MONARCH MACHINE TOOL CO

A base from which production cutting speeds and feeds may be determined has been established from the test results discussed in previous articles. This research has proved to us that many production operations can be more profitably turned at higher speeds. In many instances, a better-balanced cutting condition is obtained with carbides at 500 to 700 fpm than at 250 to 300. In most cases rapid tool-wear is experienced above 600 sfpm, but satisfactory tool life may be obtained through proper tooling, improved machine rigidity, control of microstructure, and using coolants to remove excessive heat.

To establish the optimum cutting condition requires an individual machining test on the part in question. In machining, the variables are many. Often various factors work in opposition to each other. This circumstance makes it difficult to establish feed and speed charts that apply to all cases. In rating the machinability of a given steel, we are interested in: (1) its resistance to internal shear, and (2) the frictional properties of the metal as it leaves the tool surface.

Physical properties of a steel that affect the unit shear value required to produce a chip are: (1) the bulk hardness, (2) the yield-tensile ratio, and (3) the strain hardenability or Meyer exponent.* Of these the yield-tensile is of particular importance, because it determines the amount of compression that takes place ahead of the tool prior to internal shear. In addition, the microstructure, carbon content and inclusions in the steel have a direct bearing on the frictional action of the chip.

Without resorting to metallurgical information of the type listed above, machinability ratings can be made directly from a simple force test. Using a standard cutting condition, the vertical and thrust forces are obtained with a dynamometer (AM—June 8, page 142). From the cutting force and chip area, the unit shear strength of the metal being cut can be determined. The ratio of the feed force to the cutting force is also important, because it indicates the frictional wear produced by the chip. For example, sulfurized steels have a large F_c/F_t ratio compared to spherodized steels, which contain a high percentage of free ferrite. In addition, another machining factor to be considered is the ratio of the feed rate to chip thickness. This value is called the cutting ratio, and increases as the amount of deformation from shear decreases.

** The Meyer exponent may be defined as N in the equation $L = aD^n$. L is load, D is diameter of impression. A low value indicates a low degree of strain hardenability.*

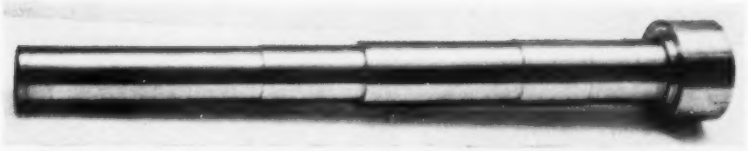


FIG. 3 . . **CAMLOCK SPINDLE** is turned from AISI 4145 bar stock in three passes in a cycle time of 11.8 min. Cutting speed 540 fpm, feed rate 0.020 ipr

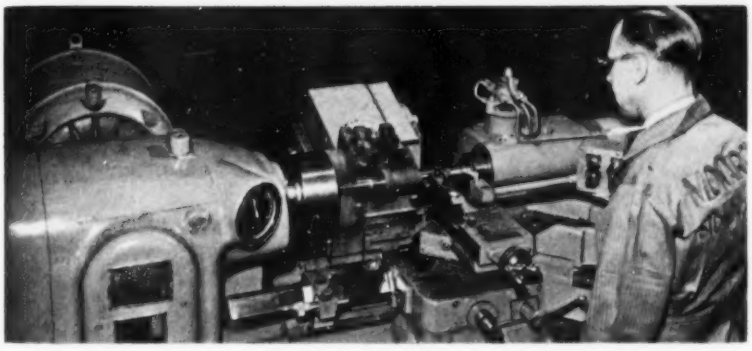


Fig. 4 . . **COUNTERSHAFT FORGING** is an example of a part where contour machining at high surface speed is made feasible, because the maximum depth of cut is 0.250 in. Speed: 700 fpm, max.; feed 0.012 ipr

Four jobs demonstrate that balanced cutting conditions can be obtained at 500 to 700 fpm. Machinability ratings obtained from force tests reveal suitable cutting speeds; a rapid tool-life test produces the optimum feed rate. Then with correct tool design, one has set up the conditions for optimum machining

OF MACHINABILITY TESTS

Through a large number of machining tests, we have established force bands for a number of common alloy steels. If a bar being tested falls within the accepted range for that steel it is classed as having normal machinablity. Both the feed and thrust force are used in rating the steel.

Once a surface speed is determined, rapid tool-life tests should be run to determine the optimum feed rate. This is particularly important above 500 fpm on large production runs. Feed-vs-tool-life curves will normally show a critical point or maximum life as is evident in Fig. 2.

If a more complete picture of machinability is required, chips may be mounted for examination. The distortion of the chip metal along the base of the chip indicates the degree of frictional shear which has taken place during the machining. When a high amount of surface welding occurs at the chip-tool interface, it is preferable to increase the feed and to reduce the surface speed.

Fig. 3 shows a camlock spindle cut from 3¾-in. dia barstock to 1⅞ in. at the small end in three passes. The material is AISI 4145 steel having a Brinell hardness of 223. After initial machining tests, this part was run at 710 sfpm with 0.012-ipr feed. Under production conditions, difficulty was encountered in holding to this surface speed. Inconsistent tool grinding, poor chip breakers, and variations in the steel microstructure suddenly became more of a problem than they appeared to be at lower speeds. These faults made it necessary to alter the cutting condition to 540 fpm to obtain economical tool-life. The feed rate was increased to 0.020 ipr to maintain the new cycle rate of 11.8 min. or less than half the former time of 26 min. before developing an optimum machining setup. Depth of cut ranges from 0.250 to 0.312 in. while roughing and 0.125 in. for finishing. Here is an excellent example where the most economical cutting condition was not necessarily at the highest possible surface speed. There are many operations, which require a lighter depth of cut, and which allow use of surface speeds above 500 fpm. Fig. 4 shows a countershaft being turned at 881 rpm, resulting in a maximum surface speed of 700 fpm. The feed rate is 0.012 ipr and maximum depth of cut is 0.250 in. The part is turned from AISI 8620 steel.

Speeds of 700 to 1100 fpm can be realized under controlled conditions, but normally tool costs increase when operating at these higher speeds. The gain in ma-

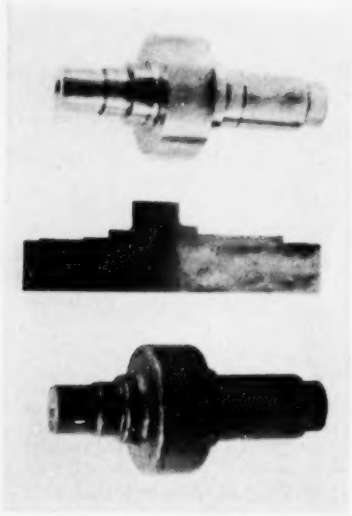


FIG. 5 . . A LIGHT CUT, 0.125 in., permitted turning this AISI 4140 forging at 730 fpm and a minimum feed rate of 8 ipm

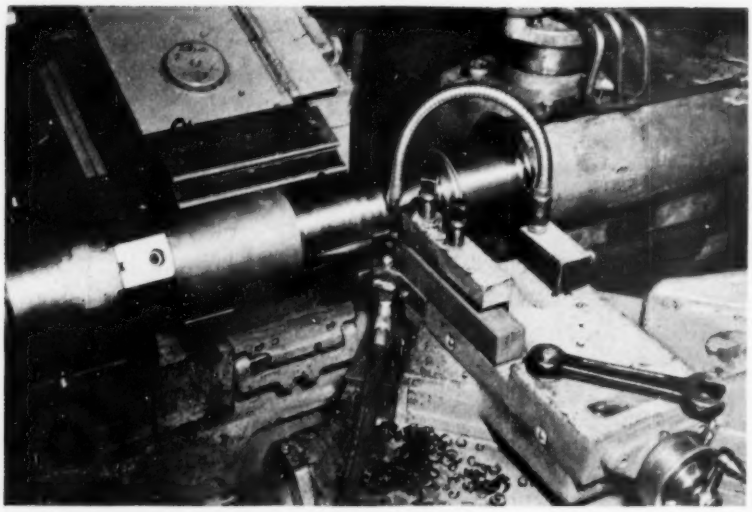


FIG. 6 . . GOOD TOOL DESIGN plus jet cooling from below and spray cooling from above the tool made it possible to turn an AISI 8640 bar at 1200 fpm and 0.012 ipr in one pass and get a 20 to 30 microinch finish, eliminating a finish cut

chining time can offset this disadvantage, providing the traverse and handling time is not the greatest part of the total cycle time.

Fig. 5 shows a forging that was finish turned at 730 fpm. The part shape and limited stock removal made an ideal condition for high speeds.

Effective tooling for high-velocity turning requires rigid holders, higher positive rake angles, and carbide grades having good crater resistance. The tools should be free of grinding or brazing strains, because the chip area decreases with increasing speed, thus concentrating the normal force on the tool surface. Importance of chip-breakers is often overlooked. At high speeds, the thin ductile chip produced is sometimes difficult to break. However, narrow breakers can overbreak a chip, causing chatter and chipping of the cutting edge.

Excessive heat at the cutting edge of the tool limits the life of the tool. Cooling problems become much more difficult as the surface speed increases. Fig. 6 shows the use of jets in attempting to drive the coolant into the shear zone. An appreciable reduction in the amount of flank wear is obtained, but cratering of the tool surface still remains as the limiting factor. This particular bar of AISI 8640 steel was turned at 1200 fpm, using a K5H tool having a 20° side rake angle. Very little heat was left in the work and the surface finish was between 20 and 30 micro-inches. The chip was white, had a high cutting ratio, and showed little sign of chatter. Work distortion and tool buildup were completely eliminated. The machining time was reduced and a finish pass eliminated. The care and time required to tool up for high speeds can be well justified by these advantages.

This article concludes the series by Mr. Albrecht.

EQUIPMENT FOR MACHINABILITY TESTS

There is no substitute for a rapid, reliable test to reveal optimum cutting conditions for a specific job and material. The setup used by A B Albrecht can easily be duplicated (and has already been) in metalworking plants. The lathe should be equipped with a dynamometer toolpost that measures two force components: cutting or vertical force, and feed force. Strain-gage dynamometers have proper sensitivity and are easily connected through amplifiers to recording instruments. By using the force data, the investigator can calculate unit power factor, normal force on the tool, shear strength of the material and frictional force.

Additional facilities are required to make chip studies. Flow lines are revealed by use of basic metallographic equipment, such as a mounting press, polishing table and metallographic microscope. A photographic attachment makes it possible to record flow lines for study and reference.

WHAT TO DO FOR Distortion Control IN LARGE RINGS

By MAURICE JENSEN, THE KAYDON ENGINEERING CO

RACES for large roller bearings can be made from three kinds of stock; hot-rolled and butt-welded bar, forgings, or castings. Material is generally SAE 52100, but may be S or K monel or stainless if the bearing is to be installed in a corrosive location.

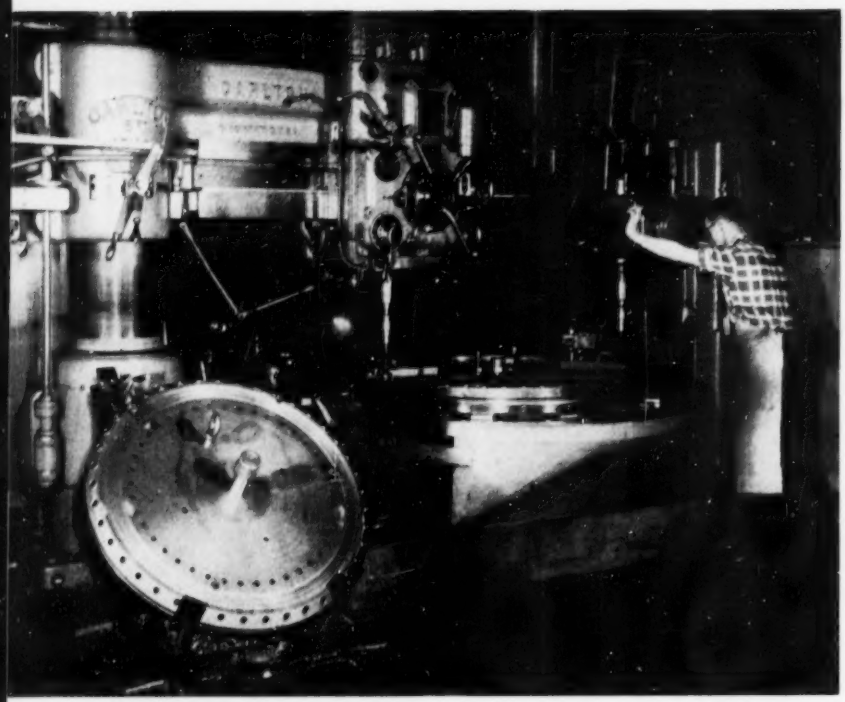
After the ring is formed, machining presents some difficulty. A ring as thin as the "wedding ring", which has a 17-in. OD, but a section of only 3/8 in. and a weight of only 2 lb, is subject to warping and bending during manufacture. Machining distortion cannot be removed by heat-treating, so machining must be accurate. Considerable allowance, often as much as 1/8 in. on the larger sizes, is made for grinding out distortions from heat-treat and hardening operations.

Boring-mill work is done with a ring flat on the machine table, often clamped with opposing pads on the ID and OD so clamping pressure will not pull it out of shape. Maximum-area gripping surfaces and minimum spacing between clamps provides as much support as is practical. If the rough ring is already distorted from the first forming process, shims must be added to the setup to provide machined surfaces as true as possible.

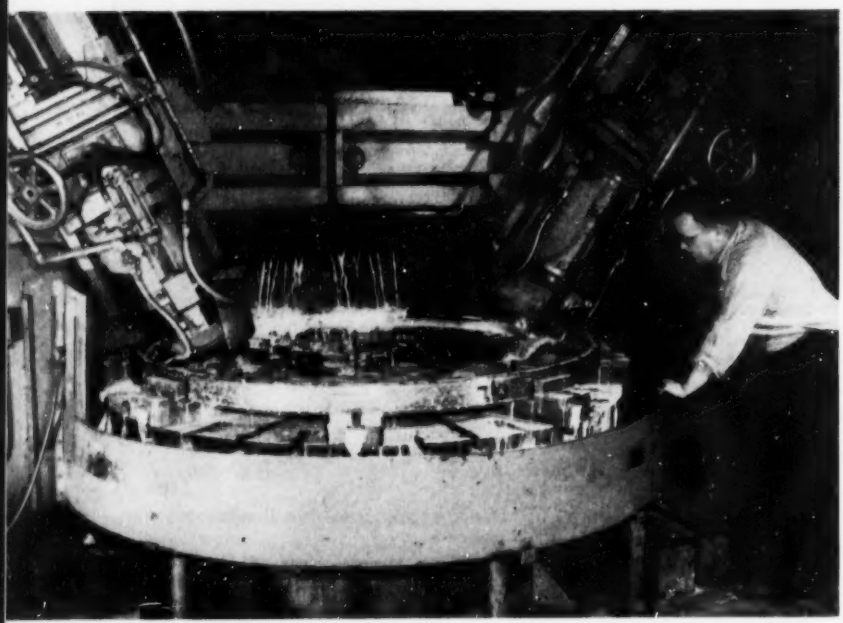
Raceway hardening is necessary, of course, and so is heat-treating for all rings that are flame-hardened—to provide a strong, tough core. Support during treatment must allow the rings to expand evenly, yet must carry the rings so the least possible distortion pres-

BEARING RING IS MOUNTED FLAT on King boring-mill table, held by T-bolts and clamps for roughing the OD, face, and groove. Ring diameter is 65¼ in., and is left with 0.05 in. of stock for grinding that will take out distortion later

Distortion during manufacture is often a problem where large parts with thin sections are made. Kaydon Engineering has this problem with large bearing races, some of them as big as 88-in. OD, and with thicknesses at the raceway of under ½ in. Distortion-control methods that keep this trouble to a minimum include distortion-free clamping, even heating, accurate machining, and skillful inspection

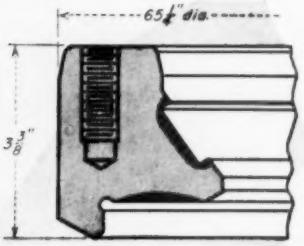


TILTED FIXTURE AT CARLTON RADIAL is for drilling, and flat fixture on Sibley drill is for countersinking mounting-bolt holes. This job is usually done after flame-hardening but before final grinding

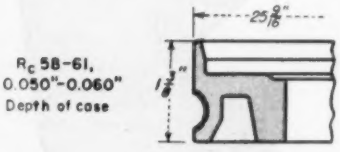


OUTER RACE IS CLAMPED ON EIGHT BLOCKS for semi-finishing grind on Frauenthal machine. Two 12-in. wheels operated by 7½-hp motors at 1800 rpm leave only 0.01—0.015 in. for finishing. Table can be fitted with extension segments to take ring diameters up to 88 in.

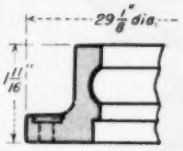
INNER RACE MOUNTED VERTICALLY in Stearns-Roger flame hardener is controlled electronically to rotate at 6 ipm past torch with flame and water-quench heads spaced specially for the shape of the groove. Final hardness for the ring is 50—55R_c



R_c 58-61, 0.094"-0.125" depth of case



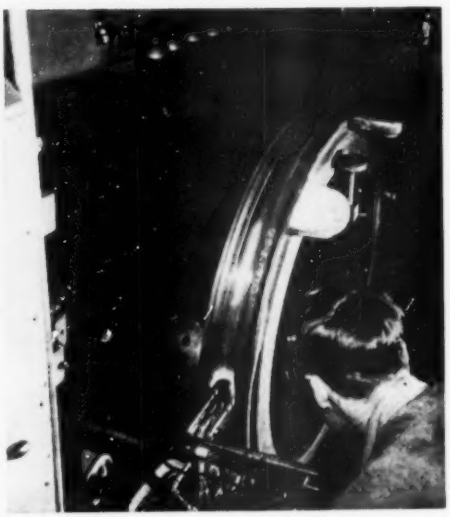
R_c 58-61, 0.050"-0.060" Depth of case



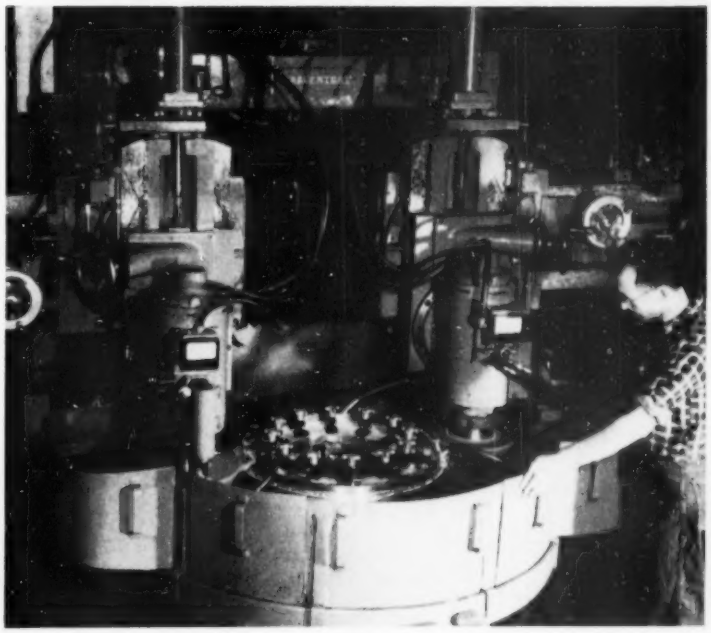
R_c 58-61, 0.050"-0.060" Depth of case

R_c 58-61, Through hardened steel

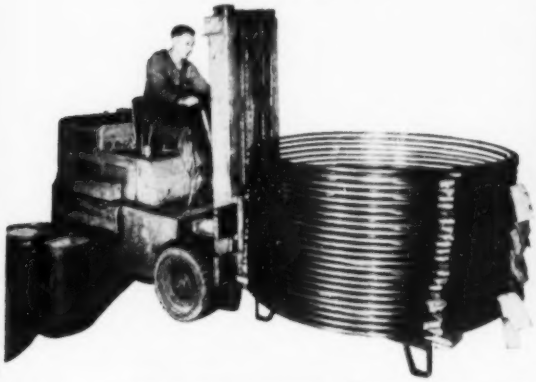
TYPICAL RACES for large-diameter bearings include three with flame-hardened races and one biangular bearing that must be through-hardened



TWELVE CLAMPS HOLD RING DOWN on Frauenthal grinder for final machining. Face, OD, and fillet are finish-ground on this 29-in. ring, with ball groove and pilot dia being held within 0.0005 in. Race must be concentric and parallel within the same tolerance



SPECIAL HANDLING minimizes distortion from mechanical forces. Rings are moved from grinding to inspection on wood platform carried by lift truck. Wood blocks between rings keep them separated and evenly supported



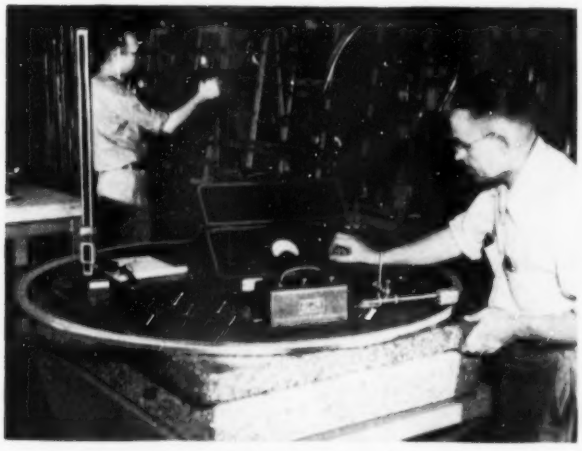
sures are present. Thus, flame-hardening is done with the ring rotated about a horizontal axis, and furnace work is done with the ring flat on a pan. Gas atmosphere in the furnace protects the ring against scaling and decarburization. When quenching, the ring is lowered flat into the tank to equalize cooling pressures.

Ultra-precision bearing rings, held to tolerances of 0.00001 and 0.00002 in., are soaked at sub-zero temperatures after heat-treatment to minimize any retained austenite, which eliminates dimensional changes during aging. Rings with diameters up to 45 in. are cold-treated in an insulated box that is mechanically refrigerated down to −120F, while larger rings are treated in alcohol and solid CO_2 at −95F.

Flame-hardeners carry the rings vertically on flanged rollers whose speed can be adjusted. Flame nozzles are of special shape to provide uniform heating over the raceway surface.

Grinding is interspaced with set-aside periods which allow the race to cool back to room temperature—another precaution against distortion. Rough grinding takes off the stock allowed for cleaning up distortion because of heating. Finish grinding finishes surfaces to 6-8 mu in. rms.

Experience with various kinds of grinders has proved the horizontal-table type best, so grinding is done in four setups, one for each side of the race, rough and finish. Setup on horizontal-grinder tables is easier than with a faceplate, and is more accurate.



TEMPORARY FIXTURE SETUP on sawhorses checks diametral clearances when 35-in. roller bearing is assembled. Most jobs of this size are special, so setups are informal, though the fixture plate is standard for the job

SURFACE-FINISH INSPECTION includes Profilometer check of race face on 50-in. ring. Limit on roughness is 8 mu in., rms

AUTOROUTING *conveyor*

cuts costs in six-floor plant...

Interfloor handling costs of small process parts in Stewart-Warner's Chicago plant were out of line.

Elevators were slow, infrequent, couldn't handle capacity-loaded electric lift trucks.

Studies showed rearrangement of layout wouldn't help.

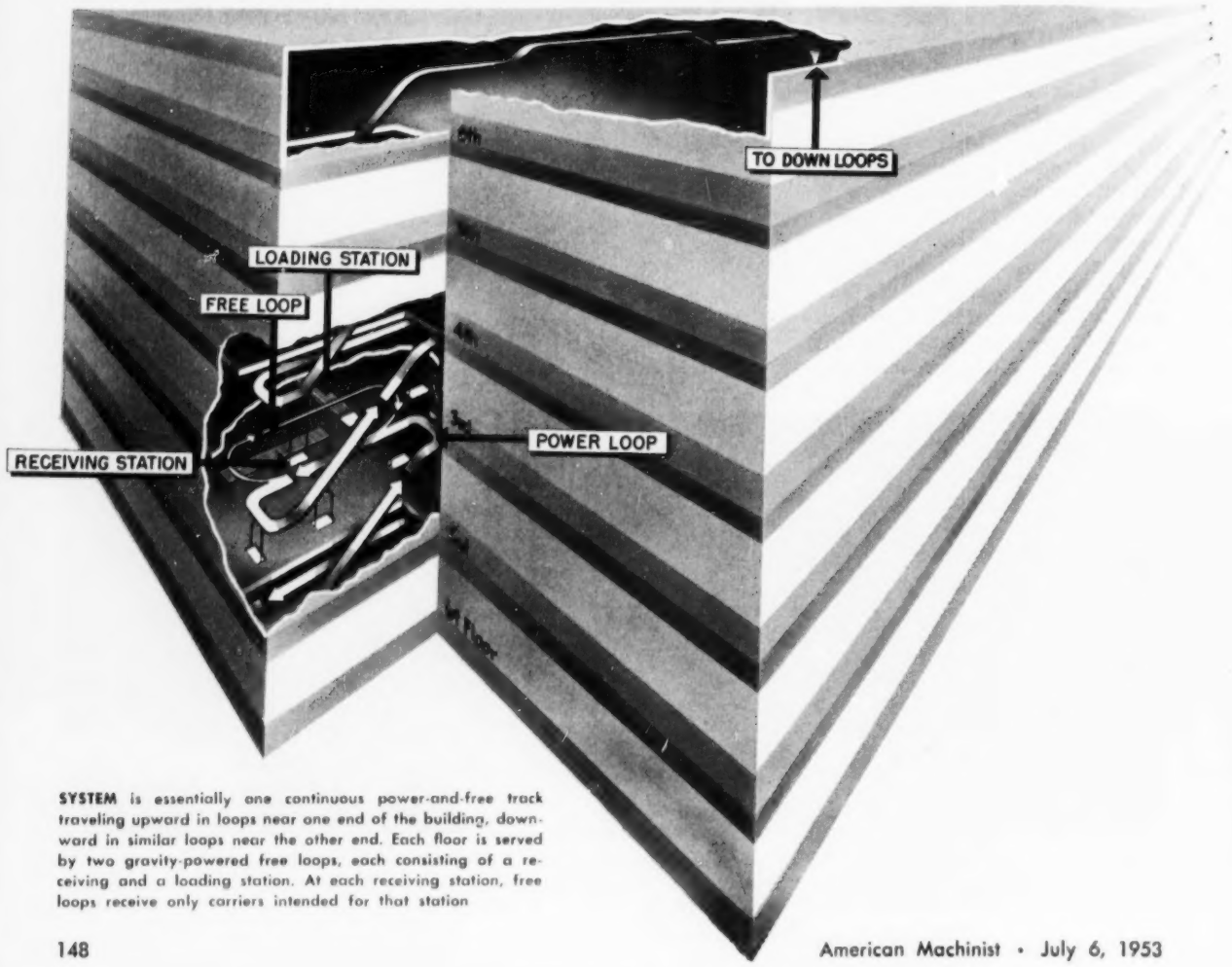
Rebuilding elevators would cost more than a conveyor system with loading stations.

Therefore the system shown on these pages was installed.

RESULTS:

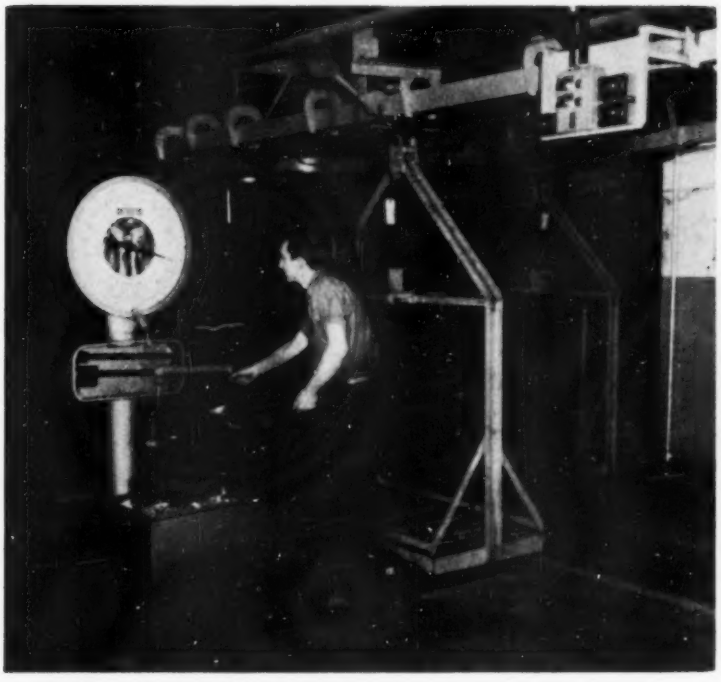
- ***Five freight elevators were put out of action.***
- ***Parts can be sent directly from one station to any of eleven other stations in the buildings; a complete circuit of the system takes 57 to 58 minutes at present conveyor speeds.***
- ***Movement of truckers is limited to half of any one floor.***

BY DAVID C PETERSON, Vice President and Dir Engineering & Manufacturing, STEWART-WARNER CORP, CHICAGO

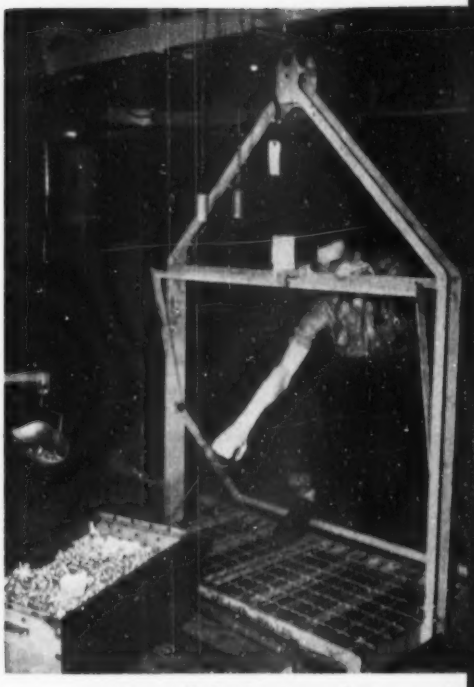


SYSTEM is essentially one continuous power-and-free track traveling upward in loops near one end of the building, downward in similar loops near the other end. Each floor is served by two gravity-powered free loops, each consisting of a receiving and a loading station. At each receiving station, free loops receive only carriers intended for that station

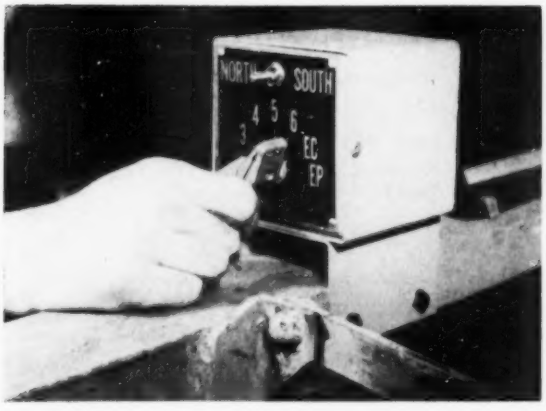
Here's how the system works:



1 ***each load of parts is first weighed then . . .***
Maximum load per carrier is 800 lb



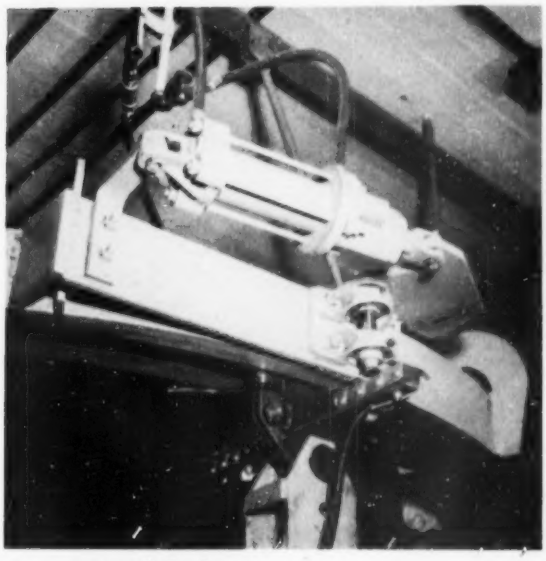
2 ***. . . operator pulls load onto carrier . . . next .***
Heavy loads are handled by truck



3 ***. . . he sets carrier selector switches to designate floor and station, pulls release chain and carrier rolls down hill to . . .***

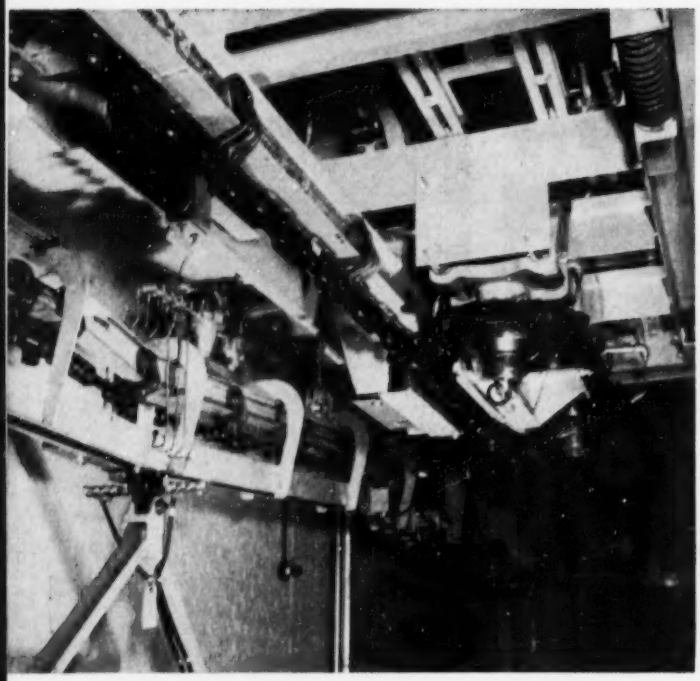
If switches are not set, carrier reenters the same loop and the error shows up immediately.

Two extra positions on the drum switch, EC and EP, are for empty carrier and carrier with empty pans. These are used at receiving stations to dispatch carriers not needed. Carriers so dispatched travel around the system until someone presses the EC or EP button on a loading station control box. Then the next carrier so designated by its drum switch is automatically diverted to the loading station

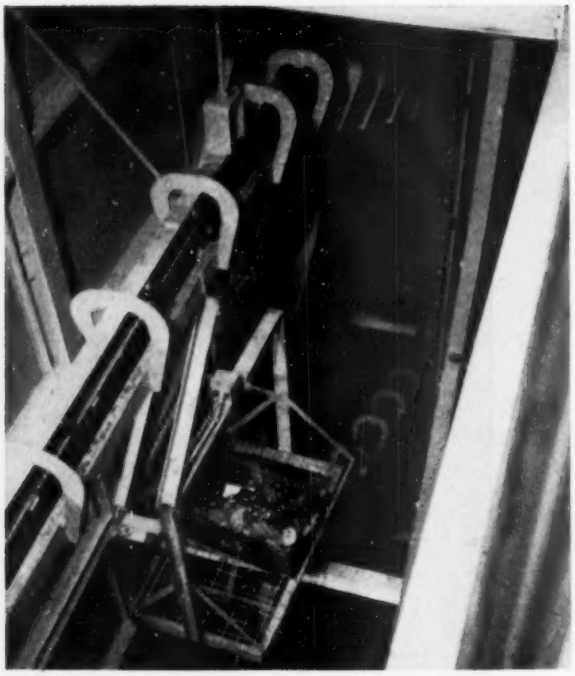


4 ***. . . automatic feeder.***
Limit switches control an air cylinder which releases the carrier when conveyor is open, preventing delivery to the main track when it would interfere with another carrier

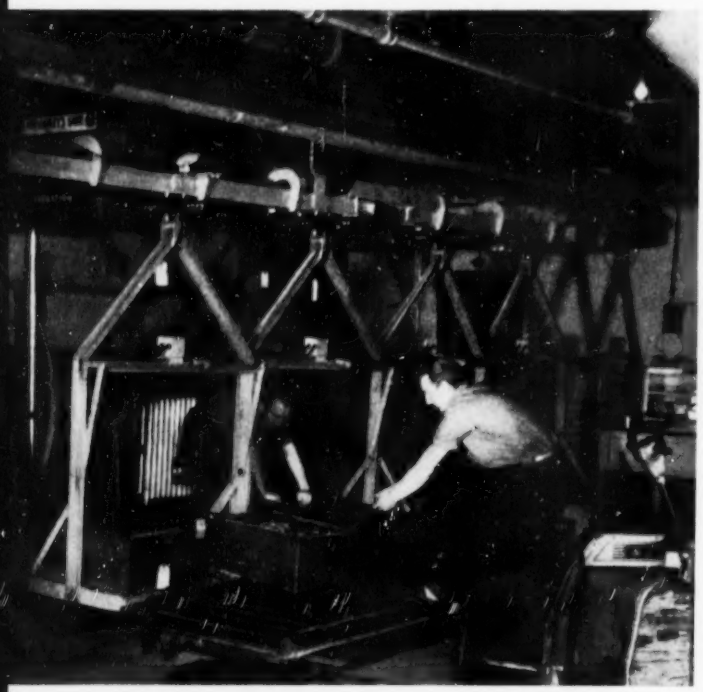
The carrier rolls down an incline to a driven loop powered by . . .



5 ***. . . chain-drive units. Conveyor moves on . . .***
Power loops are separated, making synchronization unnecessary



6 ***30°-inclined power loop to the next floor, passing***



9 ***. . . onto receiving loop.***
Arriving at receiving station, the carrier is unloaded

specifications:

SPACING OF CARRIERS:
12 ft

LOADS HANDLED:
Standard steel tote pans or 24x42x34-in. pallet boxes

TRACK:
4-in., double-channel, supported by flame-cut steel yokes under 4-in. chain track

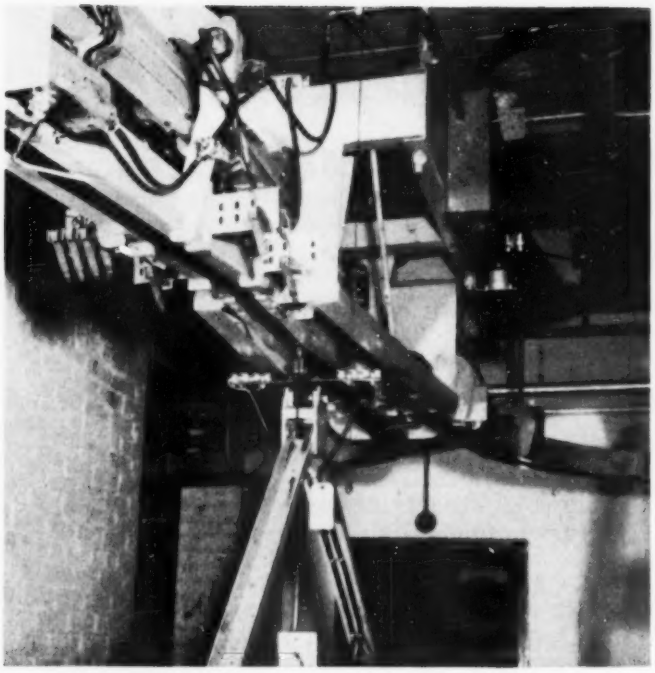
SPEED:
Variable from 10 to 60 fpm

POWERED BY:
Three 5-hp and one 10-hp chain drive units

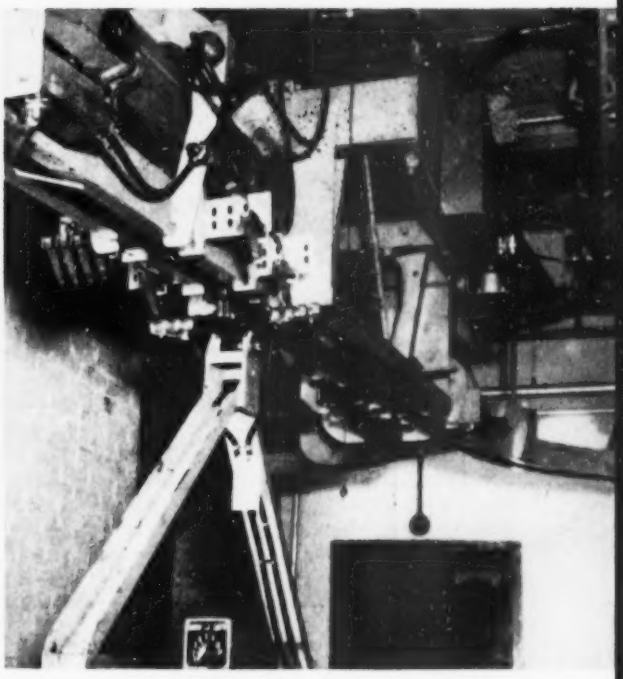
MAXIMUM WORKING LOAD ON ANY DRIVE UNIT:
3200 lb

CHAIN:
X 458 drop-forged, Magnafluxed links with ultimate strength of 48,000 lb

DESIGNED AND INSTALLED BY:
Jervis B Webb Co

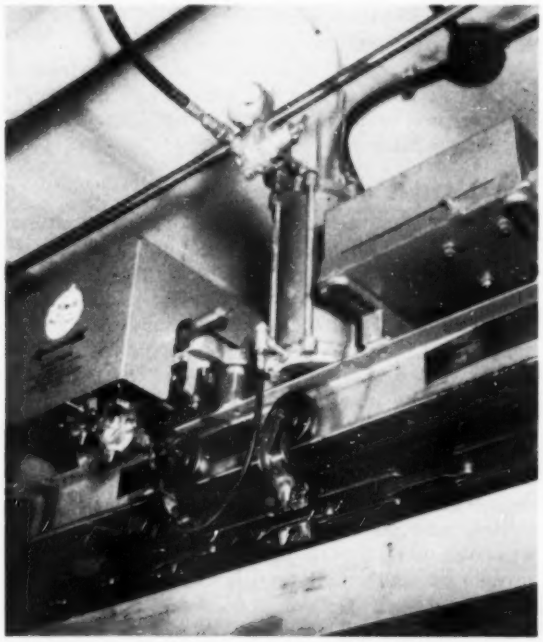


7 ***track switch controls. If the drum switch is set for that floor,***
If no contact is made, carrier continues around the system

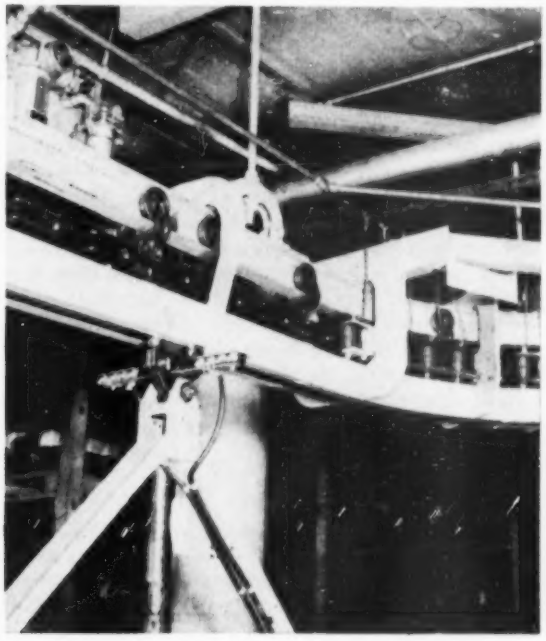


8 ***track switch wipers make contact, shunting the carrier . . .***
A solenoid valve actuates an air cylinder which moves the switch

lubrication:



AUTOMATIC ALEMITE trolley-wheel lubricator greases each of the four conveyor chains while the conveyor remains in operation



OIL-MIST UNITS spaced along the conveyor continuously lubricate the chain, trolleys, drives, and 78 roller turns in the track; mist stops when conveyor is shut off

RENTAL: *new idea in X-ray*

Purchase of industrial X-ray equipment is often a risky proposition for the small plant. Rental is an obvious alternate possibility

BY DAVID GOODMAN, X-ray Dept, GENERAL ELECTRIC CO

"To buy or to rent"—that's getting to be a big question in the minds of those responsible for acquiring industrial machinery and equipment. Actually, it's more a problem for financial or accounting departments than for manufacturing personnel. There are many hidden factors which can only be appreciated by the boys with sharp pencils.

Industrial X-ray equipment is one of the best fields in which to compare the alternatives of buying or renting. The choice is clear cut—outright purchase, or outright rental.

Rental plans involve far more than simple payment of a monthly fee for the use of a piece of equipment. And that is where problems come up. It is difficult for the average person to recognize the intangibles included in the rental fee.

The pioneer in offering rental of industrial X-ray equipment — General Electric — calls its program Maxiservice, (ie, maximum service) emphasizing the inclusion of many types of service, along with equipment, in the rental contract.

When you buy an X-ray unit outright, your expenses are by no means ended, any more than they are when you buy an automobile. The unthinking person, when he compares the purchase price with the rental fee per month, mentally or actually takes his pencil, divides the rental fee into the purchase price to find out how many months he will pay rent to equal the purchase price. This is an error, for it ignores hidden costs of owning the equipment.

HIDDEN COSTS OF OWNERSHIP

Once you buy X-ray apparatus, you have: (1) parted with a sizable amount of cash which could have been invested in other income-producing channels; (2) required the setting up of a depreciation fund to allow for replacement of equipment; (3) acquired property on which you must pay property taxes; (4) increased the cost of some of your property insurance; (5) acquired a vested interest in a piece of equipment which may become obsolete in a short time; (6) become responsible for repairing the equipment and replacing worn-out parts; (7) made it necessary to buy new or additional equipment which you did not realize you would need.

This last expense is especially true of X-ray. There are many attachments to be considered. Will you need a trailer to transport the unit? Will you need several hundred feet of cable and piping to bring power and water from remote sources? Will you need a stand to store the unit when not in use? And so on. Many of these questions will not be answered until the equipment is put into use.

Another problem is whether your maintenance will be as good as the manufacturer's preventive maintenance under a rental-service plan. The answer is probably no.

RENTAL SOLVES THESE PROBLEMS

Under the rental-service plan, all eight problems are turned into advantages for the user and responsibilities for the X-ray manufacturer. It is the manufacturer now who has his cash tied up in the equipment. He has acquired the capital investment to be depreciated and replaced; he owns more property and must pay taxes accordingly; he must carry the insurance; he must bear the burden of replacing obsolete equipment with modern at the request of the user; he must somehow dispose of the used obsolete equipment; he is responsible for repairs and replacement of X-ray, rectifying, and vacuum tubes, cables, winches, switches, and other parts which wear out with disarming regularity; and he must furnish you with additional features or attachments at an increase in fee that is a small fraction of purchase price.

In fact, the whole concept of renting, rather than selling, X-ray equipment is based on the fact that

the manufacturer of equipment is better able to carry burdens of maintenance, repair, second-hand disposal, insurance, depreciation, and taxes. He can do it on a big scale, with consequent savings.

IMPROVEMENTS IN YOUR BUDGET

Perhaps the greatest advantage of rental is that rented equipment will usually be considered chargeable against *operating* expenses.

This may vary with the locality and nature of the company, but generally the monthly cost of rented equipment (such as telephone, postage meter, accounting machine) has been handled by accountants and tax experts as a charge against current income.

Another result of this cost policy is that the decision to obtain X-ray equipment within a plant can often be made by one man. This has led to important savings in time when receipt of valuable contracts required X-ray facilities. If purchase is being considered, it is often necessary to hold a meeting of the board of directors to consider the source and availability of funds for the purpose.

Also, it is valuable to a company's budget and forecasting departments to know that rental is a fixed amount, payable monthly. There is then no need to allow an arbitrary amount to handle unforeseen costs in servicing and repairs.

In one small midwest foundry producing miscellaneous castings, business volume, especially of castings in the critical class, didn't warrant investing in the 250,000-volt type of X-ray equipment needed. Critical castings were sent out to be X-rayed, at considerable expense, and no radiographic guidance was given for the perfection of casting techniques.

Management had thought of buying an X-ray unit on speculation, hoping that having the unit would command a larger volume of work, or that job-work inspection for other plants might develop. This plunge could have been taken and might have succeeded, but when the rental possibility opened up, the whole problem eased. By signing the minimum two-year rental contract and paying a monthly fee, the X-ray equipment could be acquired on a "let's try it and see" basis.

The plan worked well. Business increased. Job-work X-ray inspection for other firms helped spread the firm's reputation for good foundry work and brought in additional business. From "let's wait and see," X-ray became "pay as you go." With ownership worries off its mind, and monthly X-ray expenses a fixed factor, management could more easily plan charges to its customers.

Even firms which are heavy users of X-ray equipment find the rental plan attractive. Through it they may engage in what might be termed "tentative or flexible expansion." During long periods of heavy work loads and large contracts, they can expand X-ray capacity by renting equipment for the two-year minimum period, re-evaluating their needs for this equipment at the end of the contract period. Further retention would be on a monthly basis.

Small companies which might have had to borrow funds or increase their capitalization to acquire needed X-ray equipment find another saving in rental, which eliminates interest on borrowed funds, or the taxes, fees and dividend problems created by selling of stock.

IF YOU HAVE DEFENSE WORK

Firms with government contracts find rental the ideal way to provide facilities for what is often mandatory X-ray inspection of the product. Before rental units were available, an X-ray unit would be purchased just to enable the company to handle the contract; upon termination of the job, or cancellation or cutting back of the contract, the company might find itself suddenly faced with distress sale of equipment at distress prices. Rental solves this problem. Also, rental fees are directly and properly chargeable as part of the cost of producing the work.

Proof of the usefulness of X-ray equipment rental is that in most cases those who have rented machines retain them in the business, and rent when they need added equipment.

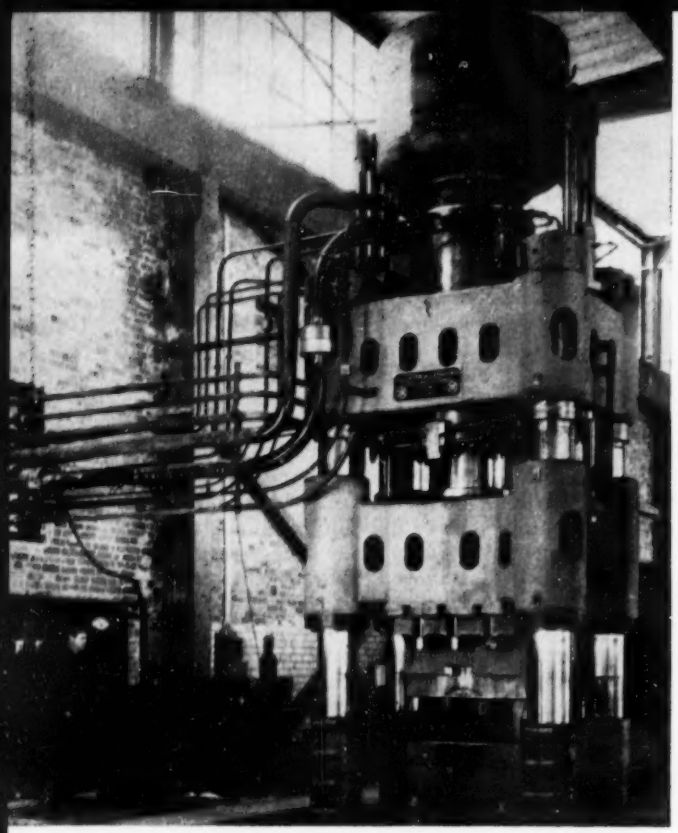
Tips

FOR TOP SHOP MEN

461 Envy yells at Reputation, "You're an accident!" And Reputation, fingering its medals, wonders idly who is making that squeaking noise way down at the bottom of the ladder.

462 Don't look for footprints to follow—make your own. If you like to cling to the coat-tails of somebody else, stop to think of what they *cover*—and you'll stop clinging.

"Zitnik, who the hell ever told you that that code call was an air-raid siren . . . ?"



FORGING PRESS at Motala Verkstad, Sweden, has maximum force of 1000 tons, with return force of 60 tons. Ram speeds are 10 ips approach, 2 ips forge, and 10 ips return. Maximum stroke is 40 in. Operating speed is up to 60 short strokes per min. at 1000 tons and 100 strokes at 100 tons. Pressure is provided by five pumps totaling 665 hp

SWEDISH 1000-TON, HIGH-SPEED PRESS:

forge with all-hydraulic control

Direct hydraulic control on a forging press installed in Sweden is reported to give almost instantaneous reversal with speeds up to 100 strokes per min

BY F H TOWLER and J M TOWLER, Directors, TOWLER BROTHERS, RODLEY, ENGLAND

The direct-hydraulic press is passing through a period of maximum complication, involving a mass of pipes—high pressure, low pressure, servo-pressure, and exhaust and water pipes for the cooling system—and a great number of multicolored wires, pushbutton switches, micro-switches, relays, solenoids, thermostats, and so on. Therefore, a certain amount of simplification seems desirable. With completely hydraulic control, it is possible to make a direct-hydraulic press as lively as a pneumatic hammer; a feature which should greatly extend the field of application, particularly for hot forging work.

Completely hydraulic control will simplify maintenance, bringing it all within the scope of the hydraulic engineer. Also it will reduce the time cycle, because a fraction of a second must be lost at each link in the chain. Every fraction of a second is important in pressing operations which demand almost instantaneous reversal at a precise position or pressure.

The oil-hydraulic system makes it possible to use packingless piston valves, in which the valve spindle is a lap-fit in the valve bore, continuously lubricated by the hydraulic fluid. Corrosion is practically eliminated.

The valve can be so designed that the valve spindle is always in hydraulic balance and only a small force is required to move it, which is not materially increased by pressures up to 7000 psi. To achieve these qualities it is absolutely essential to avoid any form of lock.

SWEDISH FORGING PRESS

One of the latest direct-hydraulic forging presses has been built in Sweden and fitted with high-speed straight in-line pumps and control valves of British manufacture.

This press was primarily designed to forge ingots and billets of high-speed and other high-alloy steels, in addition to normal forging work. It can make a continuous stroke of 40 in. at 1000 tons. Reversal at the completion of the forging stroke is almost instantaneous to limit the period of contact between tool and work.

The press is capable of making rapid planishing strokes with automatic reversal, with control of the depth of penetration. The operator controls all the ram functions with a single lever, including:

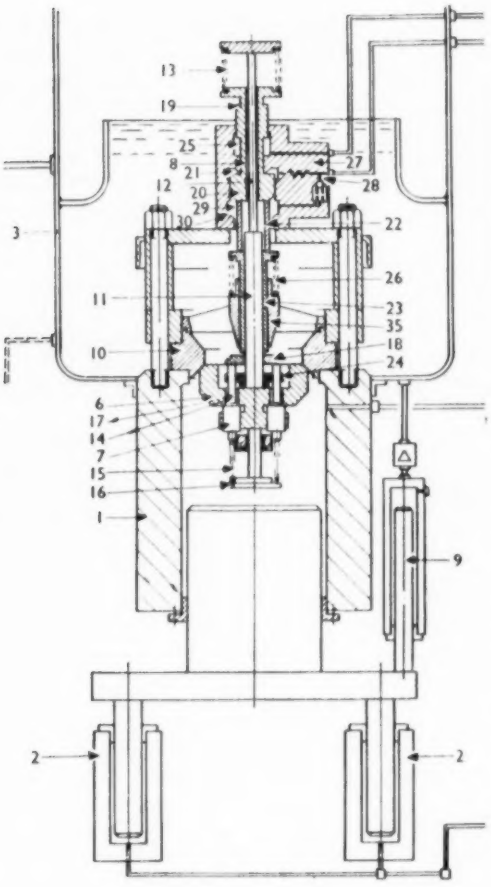
1. Up, down, and stop for a normal pressing operation.
2. Semi-automatic cycle including fast approach, forge, rapid reversal, return a predetermined amount, and stop.
3. Automatic repeated cycles including fast approach, forge, rapid reversal, return, and repeat at speeds up to 100 strokes per min.

In the second and third cycles, the force exerted by the press is directly proportional to the force exerted by the operator on the control lever—the force of 1000 tons at the press tool corresponding to about 22 lb at the end of the operating lever.

The control system is completely hydraulic and there is not a single solenoid-operated valve in it. All the valves, except the prefill valve, are manifold-mounted.

Based on a paper presented at the Institution of Mechanical Engineers

HOW ALL-HYDRAULIC CONTROL OPERATES



FORGING PRESS is the downstroke type with main cylinder **1**, pushback cylinders **2**, and overhead prefill tank **3**. On rapid approach the press ram falls by gravity and cylinder is filled from prefill tank through prefill valve **6**. On rapid return, this valve is held open and the press cylinder delivers back into the prefill tank.

Control valves: Control is provided by manually operated valve **4**, automatic reversing valve **5**, prefill valve **6**, decompression valves **7**, an actuating piston **8**, and plunger **9**. There are six decompression valves arranged in pairs around the prefill valve spindle, and each pair of stalks **17** are of different lengths, so that the valves open in sequence as stalks are contacted by striker **18**.

Actuating piston **8** has differential pistons **19** and **20**. When pressure is applied to chamber **21** on top of larger piston **20**, it forces piston **8** down along with distance piece **22** and striker bushing **23**, contacting striker **18** and opening decompression valves **7** in sequence, then contacts flange **24** of prefill valve **6**, forcing it open. When pressure in chamber **21** is released, pressure in chamber **25** (permanently connected to pushback cylinders **20**) pushes actuating piston **8** upward, followed by distance piece **22**, striker bushing **23** (lifted by spring **26**) permitting decompression valves **7** and prefill valve **6** to close. Pressure to chamber **21** passes through choke **27**, regulating speed of actuating piston. Surplus liquid passes through relief valve **28**.

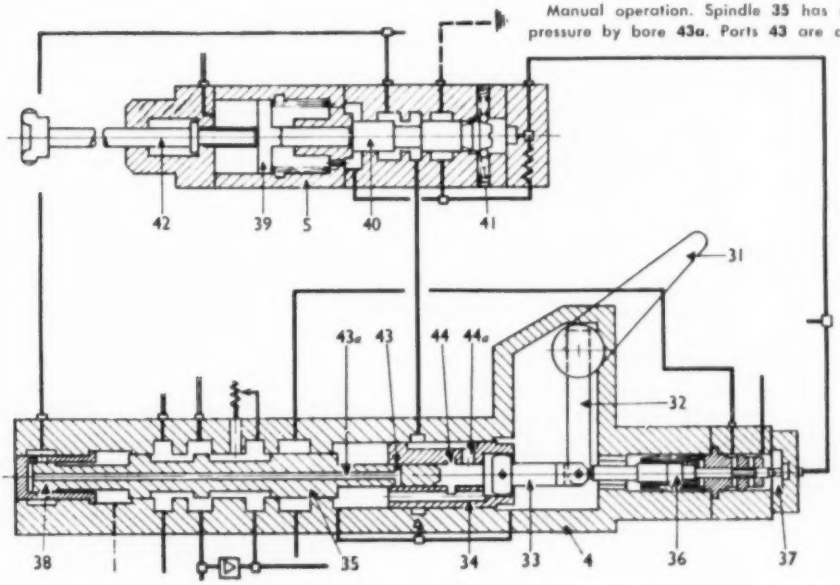
Object of relief valve **28** is to build up full pressure in pushback cylinders **2** during decompression so main ram can commence return stroke as soon as decompression valves are opened. When prefill valve **6** is fully open, piston **20** butts against seat **30**, closing escape through relief valve **28** and directing full pump pressure for return stroke.

Control valve is operated by lever **31** which has no mechanical connection with valve spindle **35**. Spindle **35** moves with bushing **34** during manual operation and reciprocates automatically by servo-pressure during automatic operation.

When lever **31** is moved counterclockwise to automatic position, internal lever **32** bears against spring-loaded piston valve **36**. Valve **36** and seat **37** operate reversing valve **5** at the end of the planish stroke during automatic cycle.

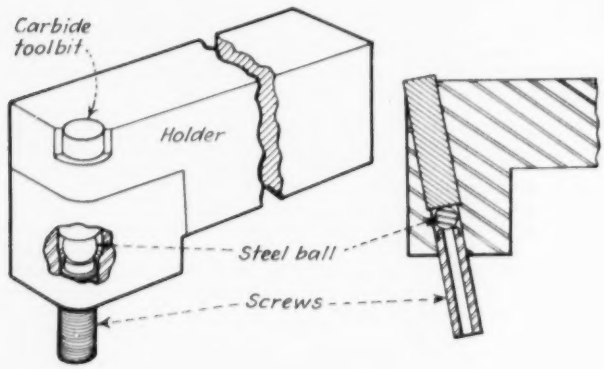
Piston end **38** is of reduced diameter and permanently subject to servo-pressure. Reversing valve **5** connects bushing **34** alternatively with servo-pressure and exhaust. When bushing **34** is connected to servo-pressure, it acts on spindle **35**, moving it to extreme left and effecting return stroke of ram; when bushing **34** is connected to exhaust, servo-pressure on piston end **38** moves spindle **35** to extreme right to effect planish stroke.

Automatic cycle is interrupted by clockwise movement of lever **31**, permitting valve **36** to close, preventing access of cylinder pressure to seat **37**. Spindle **40** is moved to right by return stroke of press ram and retained by detent **41**. Length of return stroke is varied by controlling stroke of piston **39** with screw **42**.



Manual operation. Spindle **35** has radial ports **43** connected to servo-pressure by bore **43a**. Ports **43** are arranged so that as they come into register with port **44** in bushing **34**, the pintle end of valve spindle covers port **44a**. Thus if lever **31** is moved, moving bushing **34** to the left until ports **43** and **44** are in register, servo-pressure will act on full area of spindle **35**, moving it to the left until ports **43** and **44** are just out of register. If bushing **34** is moved to the right so pintle end uncovers port **44a**, connecting full area of spindle with exhaust, servo-pressure acting on end **38** will force valve spindle to follow bushing **34** until port **44a** is covered. Thus, with reversing valve held by detent so bushing **34** is in contact with exhaust, control valve spindle **35** will move in unison with bushing **34** just as though there were a mechanical linkage to lever **31**.

Practical Ideas



Carbide Tool Life Increased By Adding Steel Ball

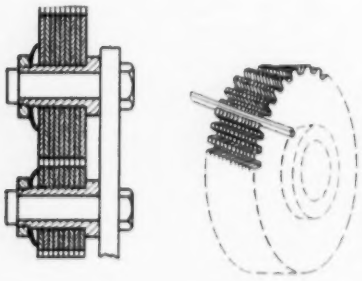
Clamp tool holders using indexible cemented-carbide cutting bits have proven highly efficient for many metal-cutting applications, so long as the bits are indexed as soon as the cutting edges are worn beyond a predetermined limit. If the machine operators do not index to a new cutting edge when wear occurs, the bit becomes so badly worn that excessive grinding is needed to recondition it for reuse, or breakage occurs—sometimes wrecking the holder as well as the carbide insert.

Recently a producer of 105-mm HE shell bodies using ½-in. dia cylindrical carbide bits in Kennamatic holders for finish turning operations eliminated losses resulting from infrequent indexing by a simple change in setup. Clamps were removed, leaving the Kennametal bits free in their holders, and a steel bearing ball was dropped into each holder to serve as a pivot point. As the holders are supported in the lathes in the conventional horizontal position, with the bit in an approximately vertical postion, cutting forces kept the bits well seated in their sockets throughout finish turning cycles.

With this arrangement, these tools could be used for 16-hr (two full shifts) without touching the bits. During these 16-hr, each insert will rotate in its socket sufficiently to distribute the wear on the cutting edge, producing a uniform 1/32-in. land on the flank all around one end of the bit.

After two shifts of operation, a tool setter visits all of the finish turning lathes and either: (1) turns the inserts end for end to position a new cutting edge, or (2) replaces the inserts already worn on both ends with resharpened inserts—and adjusts these inserts for proper height.

This simple trick eliminated a difficult problem in a case where most machine operators were inexperienced, and resulted in an extremely low tool cost for the finish turning operation. It should be equally applicable to other turning jobs where round carbide inserts are supported in clamp tool holders. *Wm L Kennicott, Chf Engineer, Kennametal, Inc, Latrobe, Pa.*



Laminated Gears Make Gear Instruction Easier

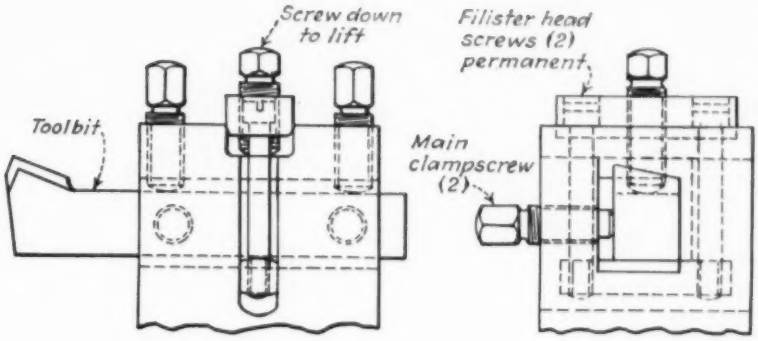
Gear design and gear cutting demonstrations are much more readily accomplished by making a pair of spur gears from two stacks of sheet disks, instead of from solid bar. The sheets should be about 1/32 in. thick or thinner.

Mount the stack of disks on an arbor between two heavier plates, clamp the stack tightly, and cut a full set of spur teeth. After deburring the teeth, the disks are assembled on a hollow sleeve which is threaded at one end and flanged at the opposite end. The stack is held in place by a nut on the sleeve, with the nut adjusted so that the disks are free to rotate. Slight friction is provided by a spring washer under the nut. Two matching stacked gears are mounted, engaged, on studs set into a steel plate.

These spur gears can be converted into helical or herringbone gears by placing a rod across the tooth space and twisting it. Using a single rod will produce a helical pattern, while two rods twisted in opposite directions from the center will produce a herringbone. Only one gear need be deformed by the rod. The other gear will follow suit. *Haim Murro, Boston, Mass.*

Distinguish Steel From CI

To identify steel, wrought iron, and cast iron, place a drop of strong nitric acid upon the ground and lapped metal surface. As acid dissolves pure iron but not carbon, a gray-brown spot appears on steel, a clear gray spot on wrought iron, and a black mark on CI. *Federico Strasser, Santiago, Chile*

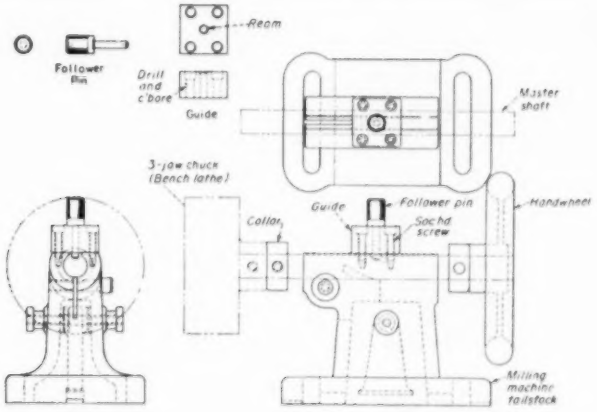


Adjustable Tool-Setter for Boring and Turning Tools

When tooling automatic chucking lathes for maximum production, several factors are involved to keep the machines running with minimum down-time and still maintain close tolerances while turning or boring castings and forgings. Standard adjustable toolholders such as vertical slides with micrometer scale adjustments cannot always be used. Sometimes it is necessary to use special tooling to permit more tooling on each turret or to utilize the minimum number of turret stations; thus save time.

Here is a method of building into the turret a tool adjustment that will quickly give the toolsetter complete control without dislodging the tool, using only one wrench, and will provide variations from a few tenths of one thousandth to 1/16 in. in a few sec. Also, toolwear or heat expansion can be quickly compensated.

The tool is gripped in a slot in the usual way with two clampscrews and it can be raised or lowered above or below center about ¼ in. Also it will, with the aid of the three other clampscrews, tilt about 5° to either side of center. The top and bottom plates are made "springy" so that the middle screw will need a minimum of attention during setting. Tools are quickly removed and can be replaced in exactly the same position, ready for resetting. Volume production on close tolerance parts (6.286 in. + 0.000, — 0.002) has been successfully maintained for a long period, using this tool. *N. Palmer, Paddington, Australia*



Cam Operated Fixture Simplifies Machining Of Spiral Grooves

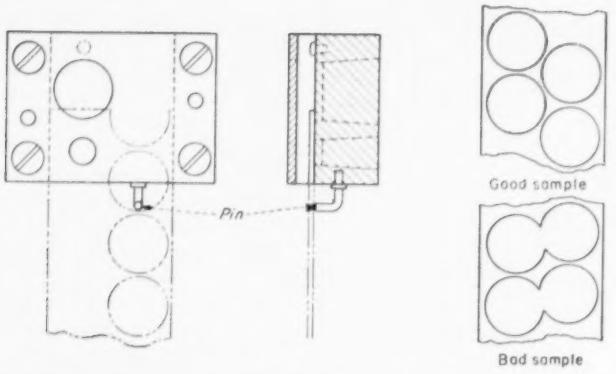
We designed this fixture to relieve our experienced toolmakers of the burden of machining spiral, oval, or radial grooves in the various parts we manufacture. Formerly a toolmaker had to set up a dividing head with a gear train to cut a given spiral. This proved to be a very tedious job. Our toolmakers now do jobs in which their skill can be used to better advantage. Less experienced personnel do this work once the master cam is cut.

The fixture is made so that a master cam with the desired shape can be milled, after which the cam is mounted into a holder. In our

case, an ordinary milling machine tailstock was used. The holder has a follower which guides the master cam. A handle fastened to the end of the master cam allows manual turning. The front of the master cam has a three jaw chuck mounted on it to hold the work and two collars are attached to act as limit stops.

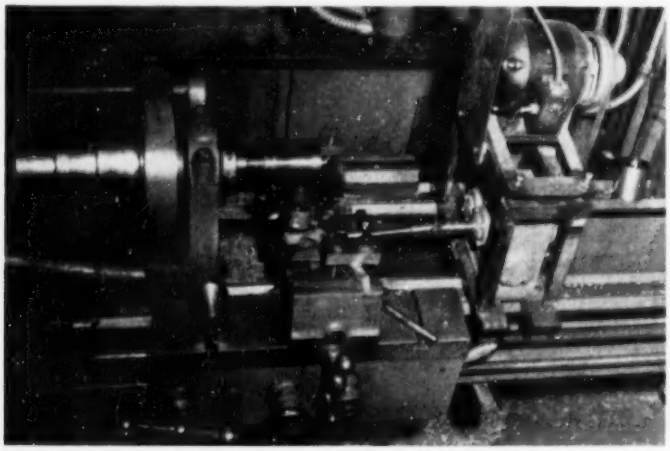
In use, the operator turns the cam so that one collar is set. The work is then loaded into the three-jaw chuck and the spindle is lowered to the desired depth. The operator turns the handwheel which forces the work to follow the exact shape of the master cam. When the other stop collar hits the holder, the operator knows he has reached the end of the stroke. The spindle is raised, the chuck is unloaded, and the master cam is returned to its starting position.

This fixture can be used on a many machines. *Joseph H Pauli, Jr, Union, New Jersey*



Pilot Pin Prevents Scrap In Progressive Die Setup

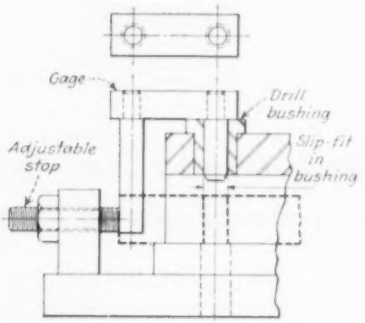
When a strip of material must be passed through the press a second time, the saving in material gained by the second pass may be wasted if the material is not properly started. To prevent the punch from hitting the wrong part of the strip, we have successfully used the starting pilot shown. This helps the operator start the piece through the press until it is picked up by the various locating pins in the progressive die. *Masahiro Yamaguchi, Kawasahi, Japan.*



Rotary Tool Speeds Turning Radius

To cut a 3-in. radius on 2½-in. dia round stock (crs) for use as a conveyor roller, we tooled a Bradford 16-in. x 4 ft engine lathe with a Monarch Shaplane Model No. 4 radius tool. It was necessary to revamp the tool but the reward was well worth the effort. At present production is better than five pc per hr. The radius is completed in one complete cycle, or one revolution of the 4½-in. dia cutting head. Cutting is fully automatic. The operator simply loads and unloads the work as is necessary.

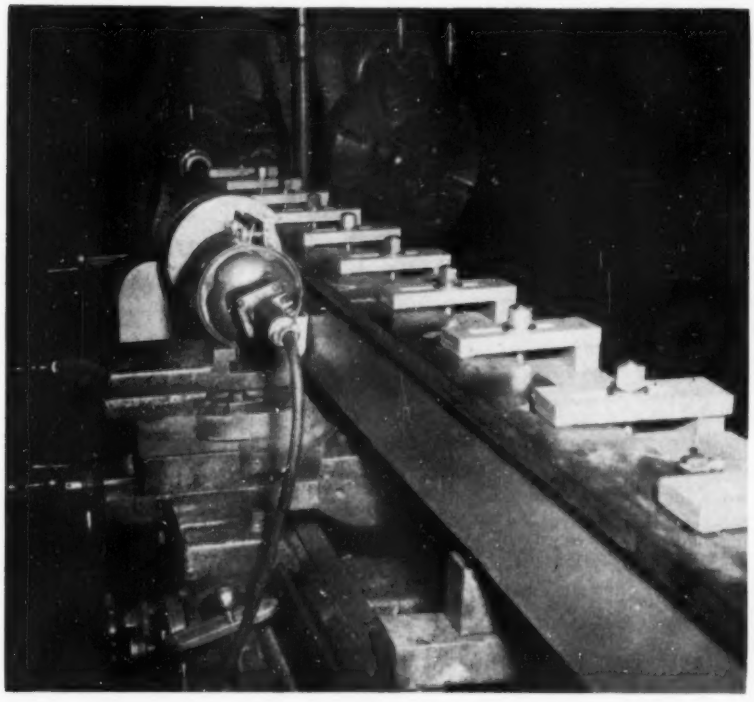
Onto the lathe ways we have mounted a box-frame table which contains an electric motor bolted to the table-top and driving a 900-to-1 speed reducer fastened in the lower portion of the frame. This motor and speed reducer combination can be removed from the lathe as a unit. From the speed reducer, a flexible shaft drives the rotary toolholder which is clamped in the toolpost on the lathe cross-slide. The toolholder contains 8 toolbits inserted in a staggered arrangement around its periphery and held with individual clampscrews. More than 100 pc are completed before resharpening the toolbits and surface finish is better than 60 rms. *W F Smith, Pres. Main Engrg and Mach Wks, South Bend, Ind*



Adjustable Stops on Drill Jig Quickly Set With Simple Gage

Drill jigs are frequently made for many different parts where the only difference is the distance from the first drilled hole to the end of the work. Instead of making a separate gage for each part, make only one jig but provide an adjustable end-stop to take care of the different distances. If a great many short runs of different parts are made, however, the stops must be reset for each run. If the operator is careless in making his adjustment, rejections will result. Also, much time is wasted in resetting.

The gage shown will not only materially reduce the danger of error, it will speed job changeover. Two pins made from hardened and ground drillrod are pressed into a small, flat, piece of crs. One pin is ground to provide a slip-fit in the drill bushing and the other pin is made so that it will contact the stop at the proper distance from the drill bushing. Then, the operator merely slips the setup gage into the drill bushing and brings his stop up until it contacts the diameter of the other pin. When a large number of different jobs are to be run, confusion and errors can be avoided by stamping size and distance on each gage. *Roger Isetts, Kenosha, Wisc*

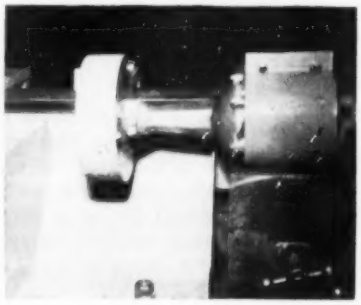


Grind Long Shear Blades On This Lathe Setup

Some months ago we were required to grind two long shear blades, each to be ground on two edges to create four cutting edges per blade. The blades were 10 ft 3 in. long, 3 in. wide, and 1 in. thick. As the shop equipment was limited, we had no grinder anywhere near this capacity. However, we did have an old lathe, with a 14 ft bed, which was in fair condition. We built an auxiliary work support which could be clamped to the lathe bed.

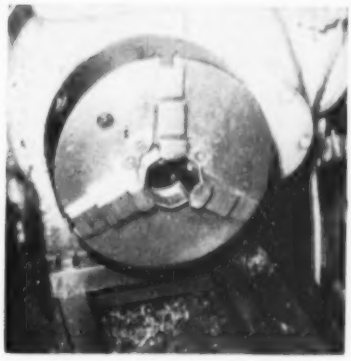
As the large photograph shows, an angle bar was used to form this support. The 8-in. leg was set horizontally to form the table and the vertical 6-in. leg provided rigidity. To give weight (mass) and thus minimize vibration, the angle plate was ¾ in. thick. This plate was bolted to the bed. At first, blocks were used to support and level the plate; later these blocks were replaced with a permanent truss under the angle bar. Clamps were attached to the angle bar to hold the blade during grinding.

From our discarded tools we resurrected an old hand grinder. By replacing the wheel-spindle bearings, installing a suitable wheel guard, and fashioning a clamp to fasten the grinder to the compound rest, we were almost ready to go. All that remained for completion was to mount and true a 7 in. wheel, a Norton 32A46-K5V BF, and to take a light cut across the angle bar to true it to the wheel. A sheet steel apron was added to deflect the emery dust and grindings; thus protect the lathe ways. The first shear blade was placed upon the work support, aligned, and clamped.



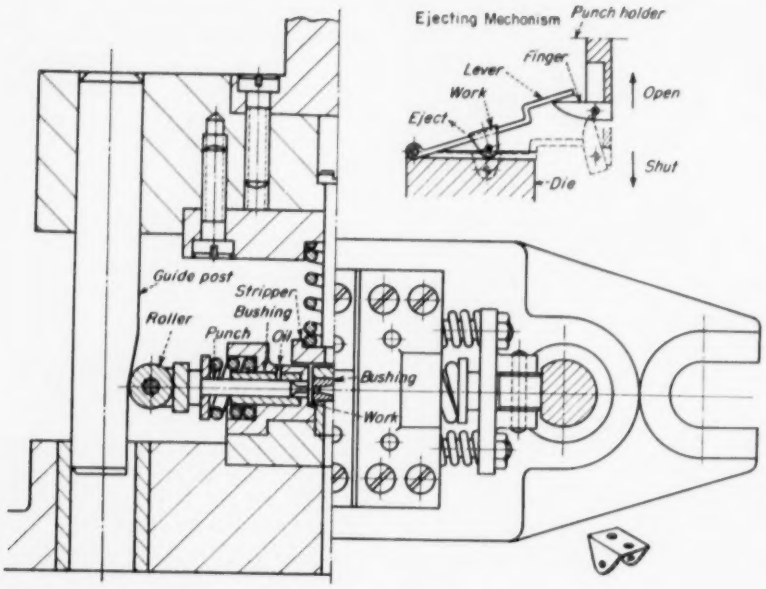
Wheel traverse along the work is provided by the power feed shaft and the wheel is advanced toward the work or withdrawn by the crossfeed screw. The compound and cross-slide gibs were made rather snug to minimize vibration originating there. On the first job, because of the work length and the necessity for blocking the bed, I ground half of the blade length, then turned it end for end. To make this come out even, the wheel spindle center must be at the exact height of the blade centerline. More recently, shorter blades have been ground without switching ends.

During the grinding operation, the lathe chuck is removed and hung from a turnbuckle suspended on a radius arm that may be swung back out of the way or forward in position to mount the chuck on the lathe spindle. *R G Hawkins, Oakdale, Calif*



Chuck Jaw Regrinding

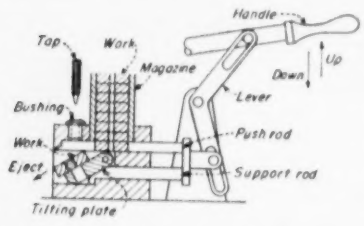
Prior to regrinding jaws for self-centering chucks (universal) with a toolpost grinder, three rectangular pieces of sheetmetal are cut to equal lengths, bent as shown, and set between the chuck jaws to brace them apart. The bend in each brace allows the jaws to uniformly tighten as well as provides clearance for the grinding wheel. Jaws should be ground to approximately the diameter they are expected to hold after grinding. Thus, play, backlash, and inaccuracies resulting from uneven scroll wear are eliminated. Even badly worn chucks will center accurately. *George R Cook, Independence, Mo*



Horizontal Pierce Die Punches In-Line Holes

We are often faced with the problem of punching in-line holes on "U" shaped parts. We have used the die described below very successfully. The holes are punched after the part is bent to eliminate any misalignment as a result of a slight error in bending.

After the part is loaded in the die and the press is tripped, two tapered guideposts force the horizontal punches to pierce in-line holes or holes at any desired location on the vertical section of the part. On the up stroke, the finger attached to the punch holder lifts the ejecting lever and the part can be safely removed from the ejecting lever. *Masahiro Yamaguchi, Kawasaki, Japan*



Fixture To Speed Drilling Or Tapping Of Flat Parts

When a great many flat parts must be drilled or tapped the fixture described below may prove advantageous. We have greatly increased production by using this fixture over all others.

The magazine is loaded with work. The handle is depressed which forces the push rod to move the lowest piece under the drill or tap. The fixture should be made so that the push rod forces the piece into the proper location for the hole to be drilled. At the same time, the support rod forces the swivel plate upward to support the work while it is being drilled. After the drill or tap has done whatever is necessary to the piece, the handle is raised. The push and support rod then returns ready to load the next piece. The swivel plate no longer being supported drops the piece out of the fixture. By linking the fixture handle to the feed handle of the drillpress, work can be fed and drilled in one downward motion of the arm. Work is released on the upstroke. *Masahiro Yamaguchi, Kawasaki, Japan*

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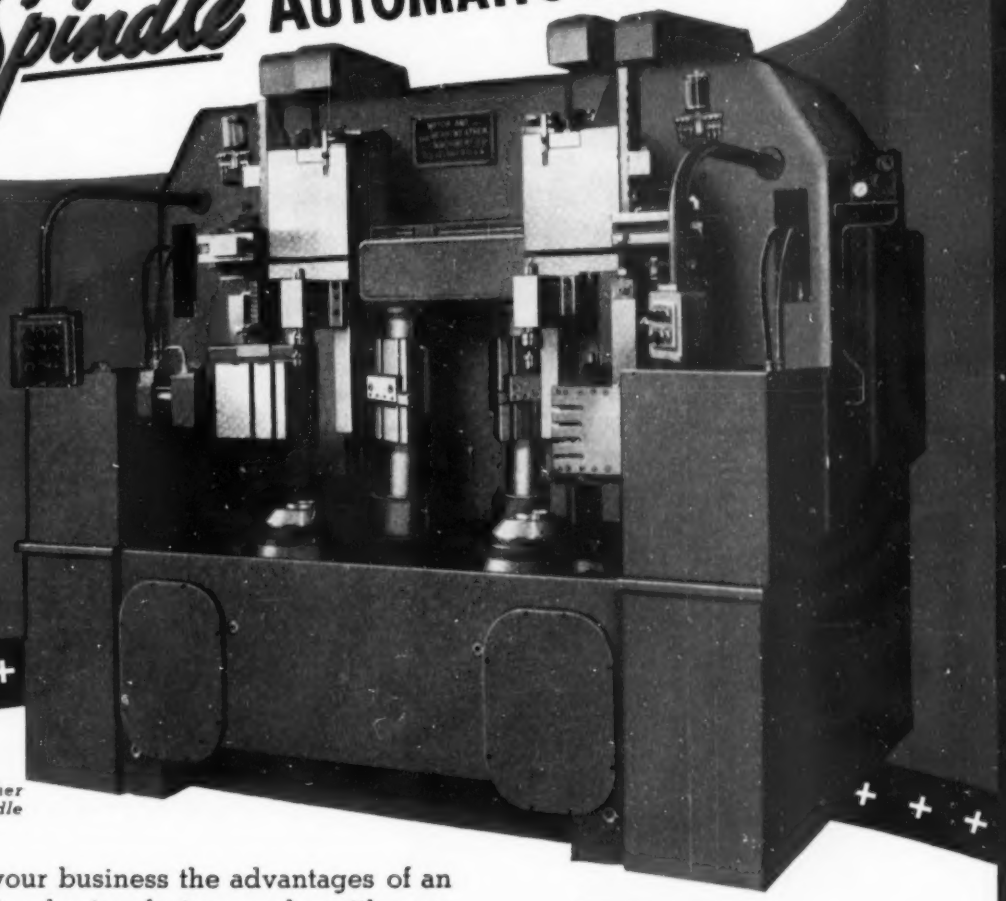

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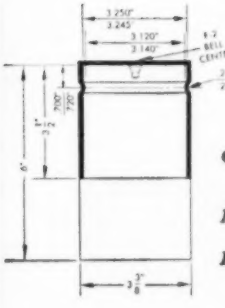
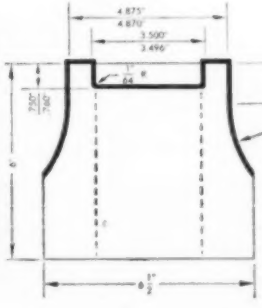


Case Study No. 96

Operation – Turn, face, groove and center drill.
Material – SAE 1335 annealed.
Production – 124 pieces per hour.



Case Study No. 124

Operation – Turn, face and bore.
Material – Gray iron casting.
Production – 60 pieces per hour.

STANDARD SPECIFICATIONS

Chuck diameter	10"
Swing	12" dia.
Work height: chucking	12"
between centers	16"
Turning slide, vertical feed	14"
Boring slide, vertical feed	14"
Facing slide, horizontal swing	6"

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Individual, selective hydraulic feed for each slide. . . . Special variations to meet individual requirements. . . . Simple contours by cam-operated tools. . . . Tracer control can be added.

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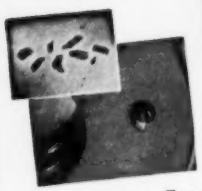
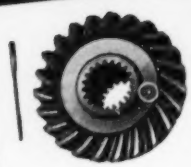
METAL DISINTEGRATION

and what it can do for you . . .

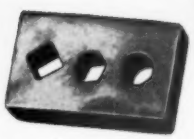


Remove Broken Taps fast without distortion

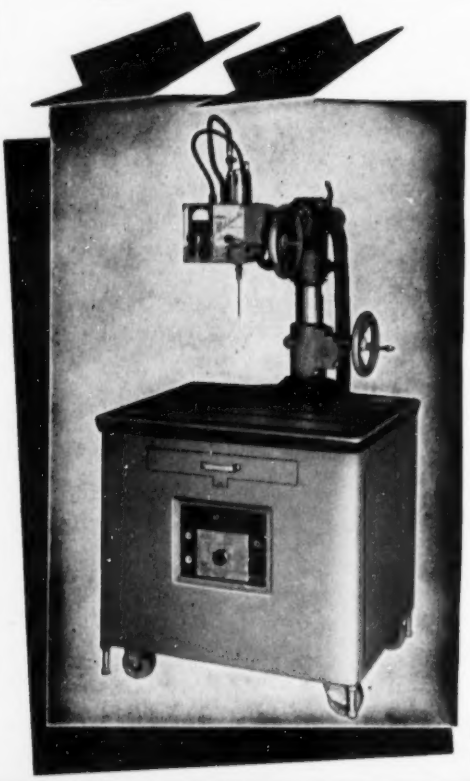


Cut oil holes in hardened gears without annealing

Cut dovetails in hardened dies



Cut any shape hole in cemented carbides



Literally hundreds of thousands of dollars are saved annually by corporations that are using Metalmasters in just tool and die repair alone.

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DIVISION OF CLINTON MACHINE COMPANY

CLINTON, MICHIGAN

Chart to determine savings from more machinable material

BY TYLER HICKS

Machinability of a metal directly affects production costs in a number of ways. Some of these are: time required to produce a part, machine operating cost, tool life, number of rejects, and finish obtainable. Where better machinability is secured at an increased cost for raw materials, we are faced with an economic problem that must be solved before we can decide if the added cost is worth the savings made.

EXAMPLE: What is the gross saving in machining costs for a part when 800 lb of steel are required for 1000 pcs, the total machine operating cost is $4 per hour, and 36 sec are saved in the production of one part with a steel of better machinability?

SOLUTION: Enter the chart at the left at the machine-operating cost of $4 per hour and draw a straight line through 800 lb per 1000 parts on the right-hand scale. Then draw a straight line from 36 sec saved, on the top scale, through the intersection of the first line with the pivot line. At the bottom read the gross saving with the new material as 5¢ per lb, or $100 per ton.

Note that the chart gives the gross saving. From this must be subtracted the additional cost of the easier machining metal. If this is 4¢ per lb, net saving is 5 − 4 = 1¢ per lb, or $20 per ton.

This chart is based on $G = TC/3.6W$, where:

G = gross saving, using easier machining material, ¢/lb

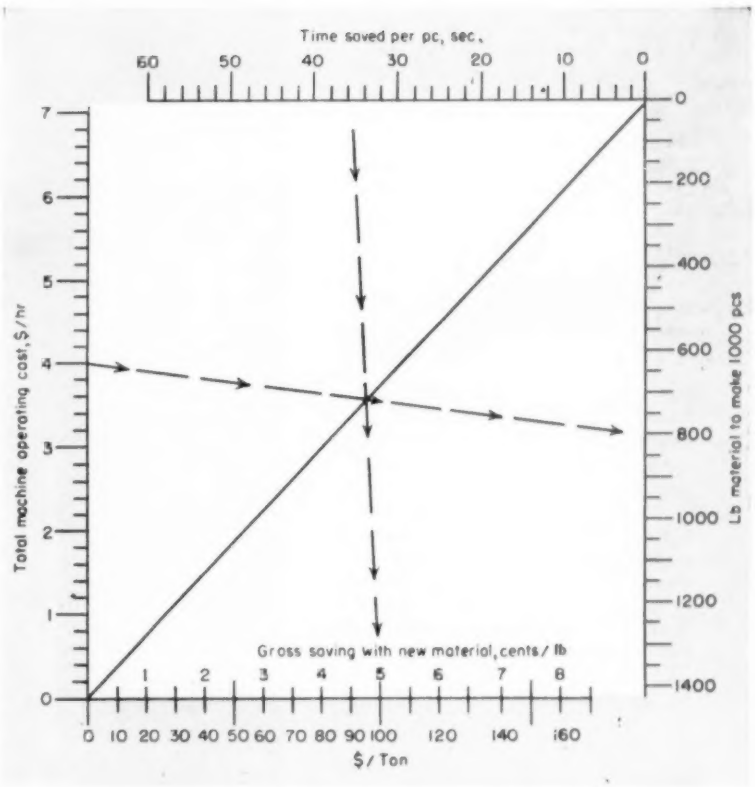
T = machining time saved with new material, sec per pc

C = total cost of operating machine (direct + indirect), expressed in *cents* per hr.

W = weight of material to make 1000 pc, lb

The relation is based on a simple derivation that takes the above four factors into account. Note that when any three variables are known, the fourth is easily found by solving in a manner similar to that described.

The derivation for this formula can be found in La Salle Steel Co's "Helpful Data Bulletin No. 9," p7.


Time saved per pc, sec.
60 50 40 30 20 10 0
Total machine operating cost, $/hr
0 1 2 3 4 5 6 7
Lb material to make 1000 pcs
0 200 400 600 800 1000 1200 1400
Gross saving with new material, cents/lb
1 2 3 4 5 6 7 8
0 10 20 30 40 50 60 70 80 90 100 120 140 160
$/Ton

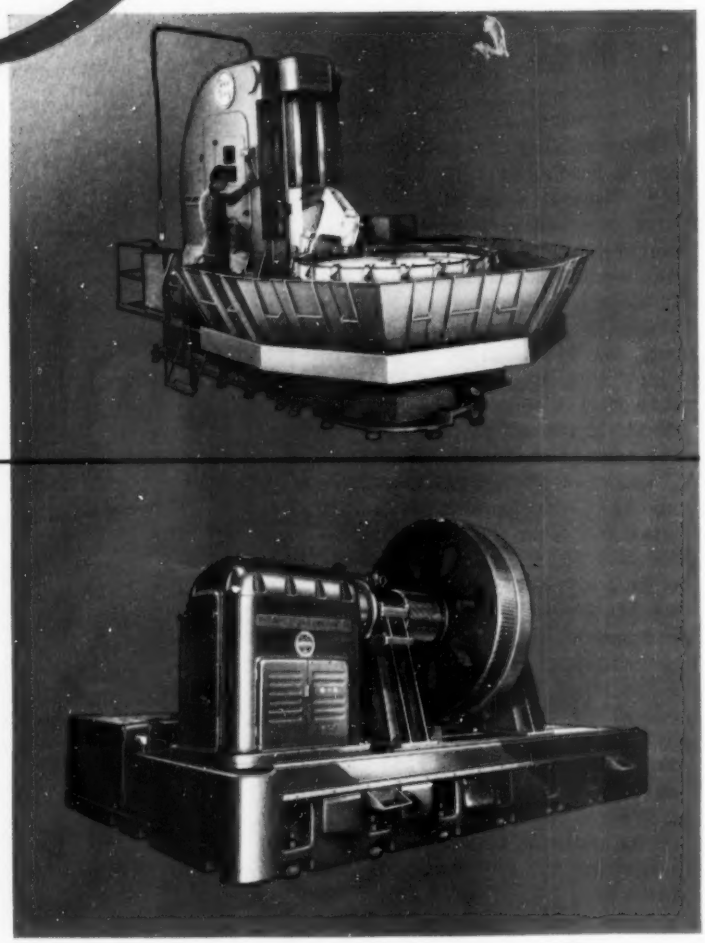
Large marine gear finishing practice moves ahead

ABOUT 11 years ago the first Red Ring machine for shaving large marine propulsion gears (up to 96" PD) was completed and put into commission. Its high precision and spectacular economy promptly initiated the now accepted practice of shaving for such gears.

Since then Red Ring machines have been built to shave larger ma-

rine gears. The United States, our fastest and largest ocean liner, launched last year, is driven by reduction gears shaved on Red Ring machines.

And now, nearing completion is a giant shaving machine to finish marine gears 15 feet in diameter to almost incredible tolerances on tooth form, pitch, lead and surface finish. With slight modifications, this unit will handle gears up to 200" PD.



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American Machinist

REFERENCE BOOK SHEET

TIME FOR DRILLING GRAY IRON

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BY V G HOTCHKISS

Table I gives the actual minutes per inch for drilling soft gray iron at the recommended speed and feeds. Drill-point length *A* and break-through distance *B* must be added to the hole depth to get the actual distance drilled.

To facilitate use, tool-care allowance is shown as a percentage of machine time, and also as minutes per inch drilled. It is assumed that HSS drills used on gray iron will permit 415 in. per grind. Allowance for drill care is based on drill size:

Drill Size	Min.	Drill Size	Min.
3/8	1.20	3/4	2.40
1/4	1.42	7/8	2.80
5/8	1.64	1	3.15
1/2	1.84	1 1/2	4.88
5/8	2.10	1 3/4	5.25

Example: To find tool care allowance for ½ in. drill. Time to drill 1 in. deep = 0.119 min. Drilling time life per grind = 415 × 0.119 = 45.38 min. Percentage actual minutes for tool care = 1.84 ÷ 45.38 = 4%. Time added for tool care = 0.04 × 0.119 = 0.005 min., as per Table I.

Table II enables you to calculate the actual minutes for deep-hole drilling. This table is based on the ratio of the hole depth to the drill diameter, and gives the percentages by which the actual minutes must be increased for the ratios presented. For a ratio of 3 you would reduce the speed 10% and the feed 10%, and the increase in actual minutes would figure out to 23%. For a ratio of 8, the speed would be reduced 40% and the feed 20%, thus increasing the actual minutes by 108%.

table I .. CONSTANTS FOR CALCULATING DRILLING TIME FOR CAST IRON

Drill Dia.	Ipr	Rpm*	Actual Min. per In.	A	B	A + Bt	Tool Care %	Tool Care Min. per In.
1/16	0.003	6717	0.050	0.031	0.006	0.037	6.0	0.003
5/32	0.0035	4478	0.064	0.047	0.009	0.056	5.0	0.003
3/8	0.004	3358	0.074	0.063	0.012	0.075	4.0	0.003
7/32	0.0045	2687	0.083	0.078	0.016	0.094	4.0	0.003
9/16	0.005	2239	0.089	0.094	0.019	0.113	4.0	0.004
11/32	0.0055	1919	0.095	0.109	0.022	0.131	4.0	0.004
3/4	0.006	1679	0.099	0.125	0.025	0.150	4.0	0.004
13/32	0.0065	1493	0.103	0.141	0.028	0.169	4.0	0.004
5/16	0.007	1343	0.106	0.156	0.031	0.187	4.0	0.004
15/32	0.0075	1221	0.109	0.172	0.034	0.206	4.0	0.004
7/8	0.008	1119	0.112	0.188	0.037	0.225	4.0	0.004
17/32	0.0085	1033	0.114	0.203	0.041	0.244	4.0	0.005
9/16	0.009	960	0.116	0.219	0.044	0.263	4.0	0.005
19/32	0.0095	896	0.118	0.234	0.047	0.281	4.0	0.005
1/2	0.010	840	0.119	0.250	0.050	0.300	4.0	0.005
21/32	0.0105	746	0.128	0.281	0.056	0.337	4.0	0.005
11/16	0.011	672	0.135	0.312	0.063	0.375	4.0	0.005
23/32	0.0115	611	0.142	0.344	0.069	0.413	4.0	0.006
3/4	0.012	560	0.149	0.375	0.075	0.450	4.5	0.007
25/32	0.0125	517	0.155	0.406	0.081	0.487	4.5	0.007
13/16	0.013	480	0.160	0.437	0.088	0.525	4.5	0.007
27/32	0.0135	448	0.165	0.469	0.094	0.563	4.5	0.007
1	0.014	420	0.170	0.500	0.100	0.600	4.5	0.008
1 1/16	0.015	373	0.179	0.563	0.112	0.675	5.0	0.009
1 1/8	0.016	336	0.186	0.625	0.125	0.750	5.5	0.010
1 3/16	0.017	305	0.193	0.688	0.137	0.825	5.5	0.011
1 1/4	0.018	280	0.198	0.750	0.150	0.900	6.0	0.012
1 5/16	0.019	258	0.204	0.813	0.162	0.975	6.0	0.012
1 3/8	0.020	240	0.208	0.875	0.175	1.050	6.0	0.013
1 7/16	0.021	224	0.212	0.938	0.187	1.125	6.5	0.014
2	0.022	210	0.216	1.000	0.200	1.200	6.5	0.014

* *Fpm for gray iron = 110* †*Add A + B to depth of hole drilled.*
A = Drill point length = 0.5 dia. B = Break through = 0.1 dia.

EXAMPLES OF DRILLING GRAY IRON

1st Example:

Hole depth, ¾ in.; drill, ½ in.
Actual depth drilled = ¾ + A + B
= 0.75 + 0.300 = 1.050 in.
Actual Min. = 1.050 × 0.119 = 0.125
Tool care 1.050 × 0.005 = 0.005
Total = 0.130

2nd Example:

Hole depth, 1¼ in.; drill, ¼ in.
Ratio: 5
Actual depth of hole = 1.250 + A + B
= 1.250 + 0.150 = 1.400
Actual Min. =
1.400 × 0.099 × 1.57 = 0.218
Tool Care =
1.400 × 0.004 = 0.006
Total = 0.224

table II .. EXTRA ALLOWANCE FOR DEEP-HOLE DRILLING

Ratio: Hole Depth to Drill Dia.	Increase Min. by
3	23%
4	39%
5	57%
6	78%
7	92%
8	108%

HANDLE ALL YOUR EMULSIFYING CUTTING OIL NEEDS with S.E.C.O. and S.E.C.O. HD "F"

Sunoco Emulsifying Cutting Oil — For general-purpose cutting and grinding. This product is more widely used in metal-working plants than any similar oil. It has high emulsion stability and cooling efficiency, excellent lubricating and rustproofing characteristics. Those features, plus low initial cost, make S.E.C.O. ideal for a wide range of machining, grinding and rolling operations on both ferrous and nonferrous metals.

Sunoco Emulsifying Cutting Oil HD "F" — For heavy duty cutting. Its extreme pressure properties give it a film strength more than twice that of regular emulsifying oils. This high film strength, plus increased "oiliness" characteristics, makes it ideal for machining jobs too tough for regular soluble oils and too hot for straight cutting oils. Emulsions of S.E.C.O. HD "F" are clean smelling and will remain so in service.

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SUNOCO

Time for Drilling Malleable Iron

BY V G HOTCHKISS,

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Table I gives the actual minutes per inch for drilling malleable iron at the recommended speeds and feeds.

Drill-point length and break-through distance are shown for each diameter of drill. These must be added to depth of hole drilled to obtain the total distance drilled.

The tool-care allowance is shown as a percentage of the machine time, and also as minutes per inch of depth drilled. This allowance is based on the inches of malleable iron drilled between tool grinds (at the recommended speeds and feeds), and the normal minutes required to make the change from the worn tool to the sharp tool.

Table II is used for calculating the actual minutes for deep-hole drilling. This is based on the ratio of depth of hole to diameter of drill, and is shown as a percentage by which the actual minutes must be increased for deep-hole drilling. In effect, it is a decrease of the speed and feed in increasing amounts, as the ratio becomes greater.

Examples explain the use of the table and bring out how the drill-point length and break-through distance are added to the depth of the hole. The examples show how the ratio is obtained to determine if the job is deep-hole drilling, and if the ratio is 3 or more, how to increase the actual time for drilling.

table I .. ACTUAL MINUTES FOR DRILLING MALLEABLE IRON WITH HSS DRILLS

Drill Dia.	Ipr	Rpm*	Actual Min. per In.	A	B	A + B	Tool Care %	Tool Care Min. per In.
1/16	0.003	5802	0.058	0.019	0.006	0.025	7.0	0.004
5/64	0.0035	3868	0.074	0.028	0.009	0.037	5.5	0.004
3/32	0.004	2901	0.086	0.038	0.012	0.050	5.0	0.004
5/64	0.0045	2321	0.096	0.047	0.016	0.063	4.5	0.004
7/64	0.005	1934	0.103	0.056	0.019	0.075	4.5	0.005
1/8	0.0055	1658	0.109	0.066	0.022	0.088	4.5	0.005
9/64	0.006	1450	0.115	0.075	0.025	0.100	4.5	0.005
5/32	0.0065	1289	0.119	0.084	0.028	0.112	4.5	0.005
11/64	0.007	1160	0.123	0.094	0.031	0.125	4.5	0.006
3/16	0.0075	1055	0.126	0.103	0.034	0.137	4.5	0.006
13/64	0.008	967	0.129	0.113	0.037	0.150	4.5	0.006
7/32	0.0085	893	0.132	0.122	0.041	0.163	4.5	0.006
15/64	0.009	829	0.134	0.131	0.044	0.175	4.5	0.006
1/4	0.0095	774	0.136	0.141	0.047	0.188	4.5	0.006
17/64	0.010	725	0.138	0.150	0.050	0.200	4.5	0.006
9/32	0.0105	645	0.148	0.160	0.056	0.225	4.5	0.007
19/64	0.011	580	0.157	0.187	0.063	0.250	4.5	0.007
5/16	0.0115	527	0.165	0.206	0.069	0.275	4.5	0.008
21/64	0.012	483	0.173	0.225	0.075	0.300	5.0	0.009
11/32	0.0125	446	0.179	0.244	0.081	0.325	5.0	0.009
23/64	0.013	414	0.186	0.262	0.088	0.350	5.0	0.010
3/8	0.0135	387	0.191	0.281	0.094	0.375	5.5	0.011
1.0	0.014	363	0.197	0.300	0.100	0.400	5.5	0.011
1 1/64	0.015	322	0.207	0.338	0.112	0.450	6.0	0.012
1 1/32	0.016	290	0.216	0.375	0.125	0.500	6.5	0.014
1 3/64	0.017	264	0.222	0.413	0.137	0.550	7.0	0.016
1 1/16	0.018	242	0.230	0.450	0.150	0.600	7.0	0.016
1 5/64	0.019	223	0.236	0.488	0.162	0.650	8.0	0.019
1 3/32	0.020	207	0.241	0.525	0.175	0.700	8.0	0.019
1 7/64	0.021	193	0.247	0.563	0.187	0.750	8.5	0.021
2.0	0.022	181	0.251	0.600	0.200	0.800	8.5	0.021

* *For cutting speed of 95 fpm.*
A = Drill-point length = 0.3 dia. B = Break-through = 0.1 dia.

Examples of Drilling Malleable Iron

1st Example:

Depth of hole, 2 in.; drill dia, 3/8 in.; ratio, 5.3

Total depth:

Hole depth = 2.000
A + B = 0.150
2.150

Actual Min. —
2.150 × 0.129 × 1.57 = 0.436
Tool care —
2.150 × 0.006 = 0.013
Total = 0.449

2nd Example:

Depth of hole, 15/16 in.; drill dia, 1/4 in.; ratio, 3.8

Total depth:

Hole depth = 0.938
A + B = 0.100
1.038

Actual Min. —
1.038 × 0.115 × 1.39 = 0.166
Tool care —
1.038 × 0.005 = 0.005
Total = 0.171

table II .. INCREASE IN ACTUAL MIN. FOR DEEP-HOLE DRILLING

Ratio Hole Depth to Drill Dia.	Increase Actual Min.
3	23%
4	39%
5	57%
6	78%
7	92%
8	100%

Minimum Ratio 3
Use nearest whole ratio number.

Ask the Man Who Has to Get the Work Out!

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Tinless Can

AMERICAN CAN, at its Oakland and Los Angeles plants, is making tin cans for motor oil without the traditional soldered side seam of an alloy of tin and lead. The new can is all steel, soldered at the seam by a thermoplastic cement.

Varied Steel

A RECENT JET ENGINE, according to the AISI, requires 109 different materials in its manufacture, 70 being various types of steel. The receiving weight of all materials is less than three tons, of which 50% is alloy and stainless steel. The newer, more powerful model about to go into production requires 133 materials, of which 100 are steel, making 95% of the total weight. Current turbojets require four times as much stainless as superalloy and about two-thirds of the steel for a jet is in forgings.

By comparison, steel is about 9% of the total weight of an airframe —the fuselage being about 20% steel and the nacelles 25% steel.

More Plate

TREMENDOUS INCREASES in the application of fabricated structures are reflected by the fact that while steel-mill ingot capacity has increased only 78% in the last three decades, rolling capacity for plate, sheet, and other flat-rolled products has zoomed. Steel-mill capacity has been expanded by 51.9 million tons since 1923, while sheet capacity has climbed from 3 million to 22 million tons a year. This seven-fold multiplication, exclusive of enormous growth also in strip and tin plate, is twice the rate of growth in unit output of the automotive industry. The higher rate of output of sheet products is attained by the shift from hand to continuous mills, which results in greater output of finished sheet per ton of ingot.

Why They Move

BIGGEST single reason for executives to leave a job is to take a bigger job —according to a recent study, "The Growing Problem of Executive Turnover," by Booz-Allen & Hamilton, management consultants. 29.9% of 422 executives who changed jobs gave this as the reason. Greater opportunity for future growth was cited by 21.6%, increased income 17.8%, disagreement with management policies 16.1%, "separation at company initiative" 14.7%, and the need for a change of activity was cited by 10.9%, but 50.9% said they changed jobs for all the other reasons combined. Recommendations of the authors to reduce turnover are four in number: A road map for the business; a sound, flexible plan of organization; a plant for selecting, training and developing executives; and a modern plan of compensation designed to fit executive's personal goals.

2% for Replacement

JONES & LAMSON has a simple—and somewhat startling — replacement policy. Two cents of each sales dollar is set aside each sales period for modernization, and can be spent by shop management without clearance by the board. Thus funds vary with the state of current business—high in good times, low in bad—and there are no delays to get financial approval. Today's dollars buy today's machines, an important factor in inflationary times.

$35/LB for Chips

ATOMIC ENERGY COMMISSION has been machining a lot (comparatively) of zirconium, which is pretty expensive stuff. Chips could be salvaged at $15 a pound, but were contaminated with four kinds of foreign matter: cutting oils, metallic oxides, dirt, and steel rubbed off the cutting tool. What had to be done to clean the chips and make them pure enough for feeding into an arc furnace offers an interesting problem in decontamination. It also raised salvage value to $35 a pound.

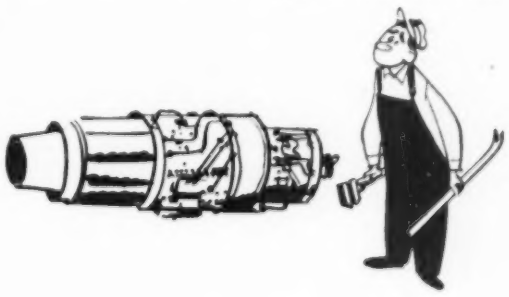
Cutting oils were removed by centrifuging at 3400 rpm for 15 min, washing in carbon tet for 30 min, then air-drying. Dirt and steel were shaken out on an 0.017 x 0.060-in.-mesh screen. But the oxides were a problem. No known substance dissolves zirconium oxide without attacking the metal, so the best that could be done was to figure out how to remove the oxides, yet leave as much metal as possible.

Tests indicated this procedure: Pickle for 8 min in a mixture of nitric acid and ammonium fluoride (takes 12-15% of the metal itself), rinse in cold water, then in alcohol, and dry. Best furnace-preparation method thus far is to compress chips as much as possible without splitting the bar formed, nibbling the bar into sand-like fines, and feeding this to the furnace.

Is it worth it? AEC isn't quite sure.

Jet Multiplication

EARLY MODEL jet engines required only one-third as many tools as current models. What's more, the jet requires 3051 job classifications instead of the 2432 required to build a piston engine in 1946.



News of Metalworking

Controversy Rages Over Air Force's Justification For Drastic Cutback in Heavy Press Program

WASHINGTON—The Air Force has canceled contracts with four producers for seven of the nation's largest hydraulic presses. The slash is in the Air Force's much-heralded $389 million program for building 17 gigantic presses to forge and extrude aircraft "structural members." Production is scheduled over the next two years.

Program Always Controversial

The program, which supposedly will revolutionize aircraft manufacture, has been the subject of much controversy since its approval in 1951. Critics say its costs are excessive and challenge productive abilities of the heavy presses. The program has been a pet target for attacks on the defense budget. But the Air Force claims the heavy presses would cut aircraft production costs substantially.

The heavy press program was originally started to meet a demonstrated need for large forgings for supersonic-speed jet aircraft now being designed or contemplated. Size of the program was determined by estimates of aircraft builders' future requirements for large forgings. In many cases, these estimates were supported by detailed plans.

The $64 questions:

- Will the program's cutback hamper designers of new jet aircraft?
- Have aircraft builders revised their estimated requirements downward?
- Or is the reduction in the program's size dictated by economy without regard for requirements?

These are important questions raised by informed persons. To date, no official statement has answered them.

It is generally recognized that the aircraft industry will not make any extensive redesign to use large forgings until capacity is available to fill any reasonable need. This is always the case when a new process is offered—witness the demand for steel strip *after* considerable capacity was provided and for aluminum *after* large capacity was available. This was the case with an 18,000-ton press in Grafton, Mass., which required several years to reach full utilization.

The question, then, is: Are the remaining presses in the program sufficient to provide this incentive to the aircraft industry and adequate to meet the needs that would arise in an emergency if such redesigns are made? They may be, but there is no evidence available to indicate that this question was considered. In fact, all the investigations made by the editors of AMERICAN MACHINIST indicate that the decision was based on budgetary considerations and not on any engineering review of requirements.

As for the economy to be gained, it is interesting to note that the only comparable press now in operation is the 18,000-ton Mesta press operated by Wyman-Gordon at Grafton, Mass. The press, originally financed in much the same way as the heavy press program, has been operating on a three-shift basis for some time and is reported by the operator to have cost the government nothing to date. The volume of work performed has made it a paying investment.

The cutback was made at Defense Secretary Wilson's order. Air Force Secretary Talbott, who formally announced the cancellations, declared that the 17 presses on order have been determined "in excess of requirements," and that their use involves "some technical and developmental problems which will take some time to work out."

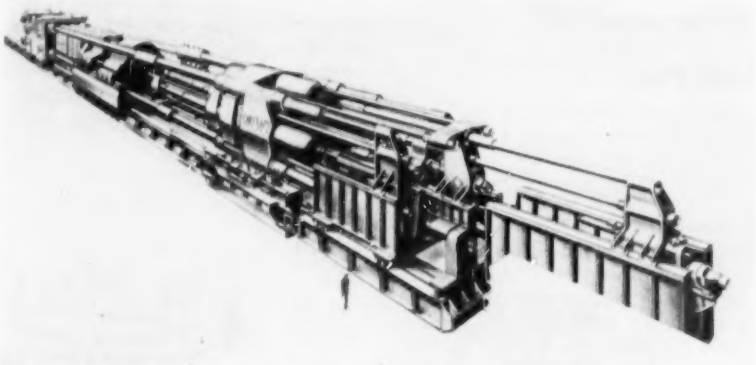
But, said Talbott, the cutback "does not reflect a change in the thinking of either the Air Force or the aircraft industry as to the value of heavy presses in the manufacture of aircraft."

Although the Air Force did not explicitly say so, the cutback is in line with Defense Secretary Wilson's drive to slash about $5 billion out of the Pentagon budget. Officials have not estimated how much of a cost reduction the heavy press program cancellations will effect.

Mixed Reactions

Washington's reaction to the cancellations was mixed. The Aircraft Industries Association, spokesman for the bulk of aircraft manufacturers, was expressing no opinion. Reason is that aircraft makers are divided on the merits of the press program. Many plane makers felt that its results wouldn't be worth the cost involved. And they weren't too sure the heavy presses would serve a useful purpose over the long run.

Stacked up against the cut in Air Force procurement, the press program cutback followed about the same pattern. The overall procurement cut was from $7.5 billion to about $4.1 billion, or roughly 50%.



CANCELLED UNDER THE HEAVY PRESS PROGRAM CUTBACK is this 20,000-ton hydraulic extrusion press scheduled to be built by Loewy Construction Co, New York, for Aluminum Co of America's Lafayette, Ind, plant

The press program cut amounts to slightly over 41%.

Private speculation among military men is that the cutback in the heavy press program is due solely to the need for reducing defense spending. But, because of aircraft industry skepticism over the presses, Pentagon officials feel that the cutbacks will not cause too much protest.

Here are the cancellations. All cover those presses farthest from completion:

- **E W Bliss Co,** Canton, Ohio—one 35,000-ton forging press and one 25,000-ton forging press. Both were to be operated by Kaiser Aluminum Corp at Newark, Ohio.
- **United Engineering & Foundry Co,** Pittsburgh—one 35,000-ton forging press and one 20,000-ton extrusion press. These would have been installed at Harvey Machine Co's Torrance, Calif, plant.
- **Baldwin - Lima - Hamilton Corp,** Eddystone, Pa. — one 25,000-ton forging press, also for Harvey Machine Co.
- **Loewy Construction Co, Inc,** New York — one 20,000-ton extrusion press and one 8,000-ton extrusion press—the former to be operated by Aluminum Co of America at Lafayette, Ind, and the latter by Kaiser at Halethorpe, Md.

These remain on order:

- **Mesta Machine Co,** Pittsburgh—one 50,000-ton forging press for Alcoa's Cleveland plant.
- **United Engineering & Foundry Co**—one 35,000-ton forging press—also for Alcoa at Cleveland.
- **Loewy Construction Co**—one 50,000-ton forging press and one 35,000-ton forging press being built at North Grafton, Mass., for operation by Wyman-Gordon Co; three 8,000-ton extrusion presses to be operated by Harvey Machine Co at Torrance, Calif, Reynolds Metals Co at Phoenix, and Kaiser at Halethorpe, Md.; and one 12,000-ton extrusion press to be operated by Curtiss-Wright at Buffalo.
- **Lombard Corp,** Youngstown, Ohio—a 12,000-ton extrusion press for Reynolds Metals at Phoenix.
- **Schloeman Co,** Nuremberg, Germany—a 13,000-ton extrusion press to be operated by Alcoa at Lafayette.

With the exception of the last press, which is already installed (AM May 25, p 163) and will be in operation this summer, the presses still on order are in various stages of completion.

Around the country, machine tool people generally were astonished at the severity of the cut in the program, but are hopeful that the situation will be reviewed when cancellation costs have been determined. The machine tool industry feels that now is the time to carry out the heavy press program, lest all-out war catch the country's aircraft industry unprepared and unable to catch up on production because of the long-lead time involved in building the heavy presses.

Some Presses 50% Completed

Investigations by the editors of AMERICAN MACHINIST reveal that several of the canceled presses are 50% or more completed. In many instances, press foundations have been completed or are nearly finished. Large quantities of raw materials have been delivered to the builders. Subcontracts have been let and large quantities of component parts have already been either rolled, forged, cast or machined. In fact, the heavy press program has now progressed to the point where this question is inevitable: Which is more expensive, to cancel the heavy press program or complete it?

Code of Ethics Adopted By Used Machinery Dealers

CLEVELAND—Members of the Machinery Dealers National Association adopted a code of ethics at their recent annual meeting as follows:

(1) Carry out spirit and letter of all agreements and contracts in both buying and selling; (2) Represent merchandise to "best of our ability" as to serial number, condition and specifications and accessories; (3) Honor every option given a customer as to price and date; (4) Not cause a customer to inspect merchandise which the dealer may not own, unless the customer is fully informed of the owner's condition of sale; and (5) Accept within 30 days from shipment any merchandise sold with a guarantee, freight prepaid for refund of purchase price, if mechanically unsatisfactory. Should any customer have a justifiable complaint against an MDNA member, he is invited to submit it to the Association.

WELDING RAILS INTO ICE BREAKERS for New York's Tappan Zee Bridge and approaches. Unusual inert-gas-shielded arc welding technique employs 1/16-in. stainless steel (308) wire at 210 ipm feeding speed to make approximately 90 in. of ¾ fillets per ice breaker. Breakers are made from 100-lb high-carbon rails, bent 60° off center, which will be mounted vertically on pilings in front of each cofferdam foundation

Distributors Named

Cleco Division of Reed Roller Bit Co, Houston, Texas, has appointed **F C Bishop Co, Inc,** Buffalo, N Y; **Flood and Calvert, Inc,** Galveston, Texas; **Paterson Machinery Co,** Nashville, Tenn; **R C Bowers Supply Co, Inc,** Montpelier, Vt; **Choate Equipment Co, Inc,** Cedar Rapids, Iowa; and **Lewis Hardware Co,** Borger, Texas, as distributors of Cleco's line of air tools and accessories.

Troy Belting and Supply Co, Inc, of Troy, N Y, has been named distributor for **American Smelting and Refining Co's** continuous-cast bronze alloy rods, tubes and shapes.

Airsupply Co, engineering and sales representatives for eastern aircraft accessory manufacturers, has moved its Los Angeles offices, formerly at 5959 W Third St, to new, larger quarters at 9815 Wilshire Blvd.

Elkro Co, manufacturers of granite surface plates and heavy industrial stands, have named the following representatives and territories: **A G Gardineau and Co,** West Englewood, N J—metropolitan New York and Connecticut; **Kenneth H Crosby Co,** West Newton, Mass—the other New England states; **Ed Schuerer Sales,** Milwaukee, Wis—Wisconsin; **Thomas E Michael Co,** Pittsburgh, Pa—western Pennsylvania and West Virginia; **Frank R Johnston Co,** Des Moines, Iowa—Iowa and Nebraska; **Shop Supply Co,** Birmingham, Ala—Tennessee, Alabama, and Georgia.

Bridgeport Brass Co has moved its new England warehouse facilities to new and larger quarters at 177 Georgia Ave, Providence, R I.

Norman S Wright & Co, West Coast representative for **Detroit Stamping Co,** has opened a new office and warehouse in Phoenix, Ariz.

Firth Sterling, Inc, has opened a branch office in Houston, Texas, for the newly created Southwestern sales district.

Meier Brass & Copper Co, 2971 Bellevue Ave, Detroit, has been named distributor for **Reynolds Metals Co** in that area. Meier will stock aluminum wire, rod and bar in standard alloys and tempers and will handle cast aluminum plate and bar for tools and dies.

NO. 29,000,000 FOR CHEVROLET rolls off the production line at the company's Kansas City assembly plant. Following the car through its final stages are (at right of car) Plant Manager W. G. Wilson, left, and Chevrolet Kansas City city manager R L Smith. Car was later displayed at GM's Motorama

Eighty Exhibits, Technical Sessions Draw 9000 to Basic Materials Show

NEW YORK—Something new in industrial shows—the Exposition of Basic Materials for Industry—opened here June 15. By the time the doors closed five days later, more than 9000 engineers, technicians and top management men from all branches of industry had a clear-cut answer to the show's most-asked question, "What is a *basic* material?"

The answer: any material basic to the manufacture of a product or component—metals, ceramics, plastics, wood, textiles, oil.

A forum for the exchange of information regarding the application of modern materials, the exposition was supplemented by a series of technical discussion sessions. Speakers included: Howard C Cross, Battelle Memorial Institute, "Materials for High Temperature Service"; Francis B Foley, International Nickel Co, "Materials for Low Temperature Service"; A F Stuebling, United States Steel Corp, "Effecting Economies With High Strength Steels"; J W Deaderick, American Lava Corp, "Technical Ceramics as Basic Materials"; J C Robinson, Atomic Energy Commission, "Materials and the Atomic Age"; Julius J Harwood, US Navy, "New Materials Developments"; and J W Frazier, Hughes Aircraft Co, "How to Select and Specify Materials."

More than 80 exhibitors utilized the entire first floor of the Grand Central Palace and the trend of displays was to demonstrate versatility. Among the firms displaying basic materials were: Adamas Carbide, American Hard Rubber, American Lava, Ampco Metals, Bakelite, Beryllium Corp, Carborundum, Cerro de Pasco, Corning Glass, Dow Corning, E I duPont de Nemours, Firth Sterling, Formica Co, Kennametal, Lepel High Frequency, Meehanite, Norton, Reynolds Metals, Rohm and Haas, Superior Steel, and Western Felt Works.

One title was clearly in evidence. If not on the visitor's badges, it certainly was in the air. Materials Engineer. Nothing has so forcefully demonstrated the importance of having personnel specifically assigned to the review and selection of materials as this complex array of interchangeable, interlocking, and overlapping materials. And the job specification calls for a man who is a combination mechanical engineer, chemist, electronics specialist, and artist. This exposition provided a common meeting ground for all industries to join in exchanging problems and the means of solving them.

Atomic Energy Commission officials and representatives were present at the show to make the first face-to-face explanation to industry executives of availability of atomic energy for development by business. Uses include measuring wear and thickness, extracting liquids with solvents, locating leaks, eliminating static, controlling electroplating, watching movement of materials.

German Machine Tool Industry Looks to Home Market As Inflow of Export Orders Drops Sharply

FRANKFURT (McGraw-Hill World News)—Status of Germany's machine tool industry is "anything but encouraging," according to industry officials. The flow of orders that had machine tool plants humming in 1952 is showing signs of drying up—this in spite of a healthy gain last year over 1951 in production and exports.

The barometer: delivery terms. In January 1952 most customers were told they would have to wait 18-24 months for machine tools. By January of this year, the waiting period had shrunk to 6-9 months. Orders to the industry have declined 50%, compared to 1952.

As a result, machine-tool prices are declining, or at least the rising price trend has been halted. The reasons: (1) raw materials, particularly iron, are "steady to declining" in price; (2) with few exceptions wages have leveled off; (3) general price levels in Western Germany have calmed down considerably in recent months.

Although deliveries of German machine tools to customers abroad show no signs of dropping off, incoming orders for tools for export have declined as much as 30 to 45%. At least partly responsible for this, the Germans say, is the cutback in armament orders and stockpiling of machine tools by the Western Powers. There is no sign that this trend will be reversed in the near future.

Facing a minor recession, Germany's machine tool industry sees two possible bright spots in its clouded future:

- When the red tape is settled and Germany becomes a part of the European Defense Community, the German contingent of the European Army will need armament and materiel. At first, it is expected, the US will equip Army and Air Force cadres. But German machine toolmakers hope they'll gradually be permitted to take over production of all needed items, with the exception of such restricted materiel as atomic weapons. If these plans materialize, the industry expects to more than regain the momentum it had in 1952.
- Barring rearmament orders, it is hoped the German government will amend its tax and amortization policies to permit modernization of industrial plants. Machine tool builders say the industry could work night and day filling domestic demand alone.

Wishful Thinking?

The latter possibility lies more in the realm of wishful thinking than on a basis of hard fact. Capital is still extremely tight in Germany and the government is hard pressed for income from taxes. Thus any immediate corporate tax relief, which would permit large investment in plant modernization, will have to wait until such pressing problems as absorption of refugees from the Eastern Zone have been solved.

Another possible stimulant to German machine tool production is the rebirth of Germany's aviation industry, coupled with German Army orders. "Our aviation industry used to be a tremendous customer," one industry spokesman says. "We realize it will take years to rebuild the industry, but we are looking forward to a fair amount of sales once it gets started again. The industry needs machine tools for almost every item it will have to produce."

Before WWII, 80% of Germany's machine tool exports went to European nations, and a great share of this total to countries now behind the Iron Curtain. Thus Germany still feels that these nations comprise its primary machine tool market. With rearmament and stockpiling orders now drying up, Germany is feeling the loss of these outlets deeply. Yet, despite anxiety to reopen Eastern markets, industry officials consider US embargo policies "Completely right," agreeing that it would be folly to ship machine tools to a potential enemy. But they are disturbed by continuing reports that some Western nations persist in selling machine tools to the Soviet bloc.

One factor is expected to have a tremendous impact on the German machine tool industry—the fall elections. If the Socialists and their political allies win, toolbuilders say, the outlook is far from encouraging. Socialization of basic materials industries—steel, iron, coal, power—is the avowed aim of the Social Democrats and industry spokesmen are outspokenly opposed.

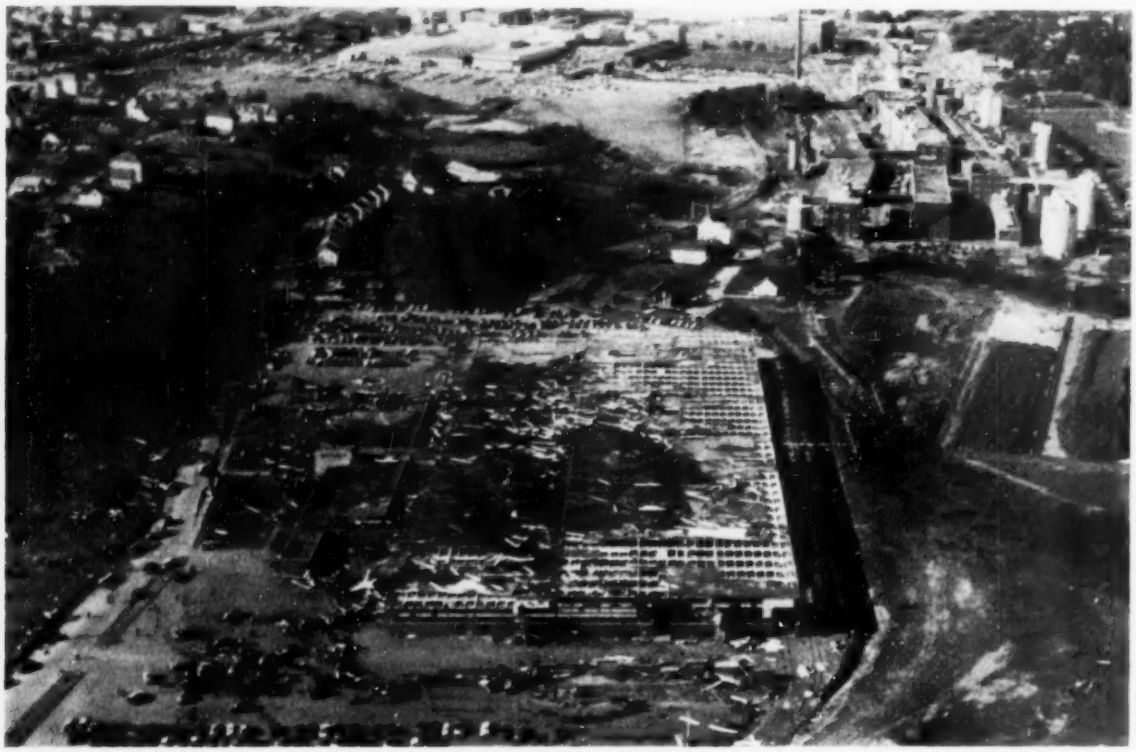
"As soon as you nationalize a number of industries," they say, "goods produced by these industries become more expensive, go into the black market, and finally disappear altogether. Socialization would spell the doom of German industry, the machine tool industry included."

Germany's machine tool industry thus faces "stagnation, with tendencies toward recession." Its outlook is a mixture of concern over present trends and hopes for a revived boom when and if German rearmament becomes a reality.

GERMAN MACHINE TOOL EXPORTS AND PRODUCTION

(In units of 1000 Deutsche Marks. 1 Deutsche Mark = approx. $.24)

	1951	1952
TOTAL PRODUCTION	**664,209**	**1,017,177**
EXPORTS	**300,149**	**587,691**
BREAKDOWN OF EXPORTS BY COUNTRIES		
Great Britain	47,410	145,792
France	23,459	44,379
Belgium-Luxemburg	11,836	22,277
Netherlands	23,359	22,261
Sweden	29,807	36,305
Italy	17,258	34,933
Switzerland	22,868	40,583
Austria	8,114	19,367
Czechoslovakia	4,676	1,331
Hungary	2,309	387
Yugoslavia	4,906	6,428
US	13,434	71,758
Brazil	20,010	33,555



AERIAL VIEW OF THE $1 MILLION DAMAGE caused to Norton Co's Grinding Machine Division plant when a tornado struck Worcester, Mass., June 9. Casualties at the new plant were relatively light because the twister hit at 5:10 pm, when office workers were enroute home and the second shift had not arrived at the plant

Norton Grinding Machine Plant on 90% Production Basis Less Than Week After Tornado Hits

WORCESTER, MASS.—Proving you can't keep a good plant down, Norton Co's Grinding Machine Division was 90% in operation within a week after suffering $1 million damage from a tornado (AM June 22 p 171).

Norton workers and construction crews started repairs on the plant a few hours after the twister ripped off most of the roof, blew in windows, stripped wall panels, broke the main steam line, demolished the plant cafeteria and damaged or demolished over 200 cars in the company parking lot.

Less than an hour after the tornado struck, key Norton personnel were on hand to inspect damages and make plans for repairing the plant.

First Consideration: Employees

With scores of Norton people homeless, however, the company's first consideration was for its employees. Facilities were set up by the company to provide financial aid to those needing it. Trucks were sent out to collect household goods and bring them to empty plant garages, where they were stored under guard. Materials and workers were rushed to help repair damaged homes. And every Norton employee was promptly assured that he would receive full pay whether he worked or not while repairs were being made.

Radio Station Assists

This accomplished, messages were broadcast over the local radio station urging workers to report for work the next morning. Contractors' crews were brought in and the recovery program was on its way.

First, the electrical system was inspected, found OK, and the power turned on. Then a contractors' crew went through the plant, cutting down damaged fixtures and other hazards.

By Wednesday morning, June 10, day after the tornado, employee and contractor maintenance crews were hard at the cleanup job—removing debris, collecting scattered production orders, digging machines out from under an inches-deep coating of mud and slime. First areas to be rehabilitated were the office and part of the cafeteria.

That evening, 104 grinding machines in various stages of completion were moved to nearby Norton plants.

On Thursday, 90,000 feet of steel roofing arrived and repairs started.

By Friday, all available Norton employees were back at work and machines were again in production. The roof was back on, and work was started on the walls and replacement of blown-out window glass. Tarpaulins stretched over damaged walls protected exposed machinery.

The result of day-and-night reconstruction efforts by Norton employees and contractors' crews: 90% of production resumed within a week after the tornado struck.

THE DAMAGE: (top) the morning after—Norton workers gather in front of the main entrance, ready to pitch in on plant reconstruction. (Bottom) Some of the 200 badly-wrecked cars hit by the tornado in Norton's parking lot

THE RECOVERY: Contractors' crews had the badly-damaged roof repaired three days after the disaster. (Bottom, left) Factory Manager Iver G Freeman watches a worker resume operations 2½ days after the tornado. (Bottom, right) Business as usual. Office workers on the job while workmen repair damaged walls

Business Items

Cooper Alloy Foundry Co, Hillside, N J, has expanded its product line to include manufacture of plastic pumps, valves, accessories and fittings.

Cincinnati Metalcrafts, Inc, recently sold its **Sebastian Lathe Division** to **Sheldon Machine Co,** Chicago. All manufacturing operations and facilities will be moved to Sheldon's Chicago plant.

Parker Aircraft Co, Los Angeles, has purchased **Proof Industries Corp,** Cleveland makers of aircraft directional control valves.

Van Norman Co, Springfield, Mass., has acquired **Diversified Metal Products Co,** Los Angeles, and will manufacture that company's line of Diversimatic centerless grinding machines at Springfield. Patterns, jigs, fixtures, etc, are being shipped from the West Coast to the Massachusetts plant.

Rheem Mfg Co, Richmond, Calif, has purchased effective July 1 the **Water Heater Division of Seidelhuber Iron & Bronze Works, Inc,** Seattle, Wash. Although the sale includes Seidelhuber's plant, Seidelhuber will continue to occupy the plant for 10 months while it completes work for NcNary Dam.

West Instrument Corp is the new name of **Taco-West Corp.** No change in company management is contemplated, and plant and offices will remain at 525 N Noble St, Chicago.

Standard Pressed Steel Co, Jenkintown, Pa., has acquired **Cooper Precision Products,** Los Angeles manufacturer of aircraft hexhead bolts. Move has been made to diversify SPS products and give the company manufacturing facilities in the heart of the West Coast aircraft industry.

Superior Tool & Die Co, Detroit, will sell and manufacture Tarex single-spindle automatic turret lathes under a licensing agreement with **Tarex, Ltd,** Geneva, Switzerland. Superior's subsidiary, **Modern Collet & Machine Co,** plans to produce about 100 of the turret lathes annually.

Lucifer Furnaces, Inc, is the new name of **Gilbert S Simonski Co,** Neshaminy, Pa., manufacturer of electric heat-treating furnaces.

Air Force Cancels Kaiser's C-119 and C-123 Contracts as Result of Senate Investigation

WASHINGTON—Henry J Kaiser's most recent venture into the aircraft industry came to an abrupt halt late last month when the Air Force canceled nearly $40 millions in two plane contracts.

The contracts lopped off by Air Secretary Talbott were the controversial C-119 Fairchild Packet second-source production at Willow Run, and the Chase C-123 transport contract scheduled for Willow Run production at a later date. Kaiser owns 49% of the stock in Chase Aircraft Co, now located in West Trenton, N J.

Under terms of the cancellation, all but final-assembly-stage work was dropped. The original contracts called for 159 C-119's and about 244 Chase C-123's. Up to now, Kaiser has delivered about 57 Packets and the C-123 isn't in production yet.

C-119 May Be Dropped

The Air Force gave no indication of what would happen to the planned production that was dropped. Washington speculation was that only a small part of the unfulfilled C-119 production would be shifted to the Fairchild Hagerstown, Md, plant. The remainder would go unordered until the stretched-out aircraft production program. Chances are that if the planes are needed at a later date, Fairchild would get the award. There is no other producer of the C-123. Speculation is that the entire planned production of this plane will be dropped permanently.

Kaiser vs. Fairchild

Background of the Kaiser cancellation centered around comparative costs between Fairchild Aircraft, original producer of the C-119, and Kaiser-Fraser, the second source. Testimony before the Bridges Subcommittee investigating aircraft production brought out the fact that Kaiser charged the Air Force approximately $1.3 million per plane, as against Fairchild's $263,348.

"Excessive Costs"

Answering charges of "excessive costs," Henry Kaiser and his son, Edgar, said that Fairchild and Kaiser unit costs were not comparable. Fairchild had produced over 800 of the planes in a government-owned plant and had a long history of production experience with this particular plane. Besides, the Kaisers were writing off tooling and other production costs on the initial deliveries. They claimed that by contract's end, costs would be on a comparable basis with those of Fairchild at the same development stage.

Bridges Committee Probe

Even so, the Bridges Committee seemed to take the opposite view. Feeling was that production costs should have been much lower because Fairchild supplied Kaiser with engineering information, technical assistance, and parts for 31 of the 57 planes Kaiser has turned out so far.

Ten Days to Land Contract

Also, the Committee wanted to know how Kaiser was able to land a multi-million dollar contract in December 1950 in just 10 days without submitting preliminary estimates. Both the Air Force and Kaiser came in for some hot questioning on this score.

Air Force brass said speed in signing the contract was based on the need for a second source of supply of the famed Packet—the basic military freight plane, and that Kaiser would produce them in Detroit, which offered a good labor supply. Besides, it looked like all-out war in December 1950 and the Air Force needed 1800 Packets. Fairchild was then turning out eight planes per month, despite a capacity of 35.

The Air Force was hard put to explain how it was that its original contract with Kaiser called for 176 Packets at an estimated cost of $82.2 million, or about $467,000 per plane. And then after a considerable shuffling, worked out a not-too-final figure of 159 planes repriced to $198.7 million—around $1.3 million per plane. That's why Talbott canceled both Kaiser contracts.

Still in Aircraft Business

Even so, Kaiser Motors still remains heavily in the aircraft business. Under license from Curtiss-Wright, Kaiser is sole producer of the R-1300 engine and is machining large forgings for Boeing, plus building large sub-assemblies for Lockheed. None of Kaiser's other aircraft contracts was under investigation or involved in the controversy.

TWO CARS A MINUTE is the production record of the new Dodge body plant at San Leandro, Calif. The new multi-million dollar addition to Dodge's West Coast assembly plant eliminates need for shipping bodies from Detroit to San Leandro. Now, stampings are shipped from Detroit to the plant, assembled on the first floor, moved by conveyor to the second floor for trim. Production rate is 400 per day. Plant also makes propeller blades.

The Labor Outlook: Is Today's Comparative Peace Just the Lull Before 1954's Storm?

WASHINGTON — Organized labor is looking ahead to next year. Much of what's happening now in the labor picture is just preliminary to more important developments expected in 1954:

• **Taft-Hartley revision** is one example. Congress recently held hearings on how to improve the 1947 labor statute. But President Eisenhower was slow in preparing his recommendations. Now Taft-Hartley will be held over until the next session of Congress.

• **Guaranteed annual wage** is another. CIO steel and automobile unions are now feeling out employers on this next big bargaining issue. But the demand won't be pressed seriously until new contract-time next June.

• **AFL-CIO unity** is a third example. Committees of both groups have agreed to a "no raiding" pact. This will go into effect next year as the first step toward a possible merger of the federations.

In a way, Congress fits into this pattern, too. The record it is making will be used by organized labor next year in trying to elect a pro-labor Congress.

Many strikes are being avoided this year. Steel workers didn't relish another long strike after the eight-week walkout last year. They may feel differently next year. General Electric managed to keep the peace, at least until next year, with CIO electrical workers. GE's CIO contract, due to expire in September, was extended to next June with the wage increase.

Southern wage differentials will come under heavy union attack next year as a result of the recent wage settlement in basic steel. US Steel and Republic Steel agreed to cut their five-cent-hourly differential in half by January 1, and wipe it out by July 1. Fabricators will be under pressure to follow suit.

National Labor Relations Board will be a very different board next year because of the appointment's President Eisenhower will make before the year is out. He is expected to name three new members to the five-man tribunal. One will be a new chairman.

Meanwhile, no firm pattern of wage increases is apparent this year. With a few exceptions, mostly in construction, unions are settling for 5-10 cent-per-hour wage increases. Modification of the five-year agreements in the automobile industry, with two more years to run, brought auto workers an increase of about seven cents an hour over last year. But some farm equipment manufacturers, notably International Harvester and Allis-Chalmers, are sticking to five-year contracts.

Fewer Strikes This Year

Working time lost through strikes is running only about 50% as much as last year. Strike threats still loom in copper mining and rubber this summer and in coal mining and railroads this fall.

Secretary of Labor Durkin is having difficulty getting the funds he wants from Congress to run the Labor Department. He's also having trouble getting three assistant secretaries appointed.

CIO relations with the White House are becoming more strained. The President has refused to name the CIO's choice for a Labor Department post. And the CIO has been ignored in drafting of amendments to Taft-Hartley, even though AFL attorneys were consulted.

British Expert Conducts Two-Day Gear Hobbing Seminar in New York

NEW YORK—Arthur Sykes, technical director of David Brown Muir Co's, England, was featured at a special seminar on gear hobbing, presented by Morey Machinery Co, Inc at the Manhattan Club, New York, June 22-23.

The first session was restricted to representatives and sales engineers of Morey; the second was presented to a selected group of prominent gear specialists from major companies all over the US.

In introducing the latest designs in hobbing and shaving equipment developed since the war, Sykes pointed out that the new David Brown machines were capable of producing gears of the highest accuracy to meet the requirements of the British Standards Institute and the National Physical Laboratories. One outstanding recent product, he said, had been a set of turbine reduction gears to transmit 73,000 hp in the main drive of a cruiser. The gear was 10 ft in diameter, with a face width of 5½ ft. Hobbing equipment now covers a 3 to 200-in. range.

In the field of gear shaving, which has been a specialty of the company since it was first introduced, in 1911, a new machine is designed to work on both the vertical and horizontal axes. Its outstanding feature, however, is its facility for radial or brake loading on the work spindle or the cutter spindle, which makes it particularly adaptable for compensation of errors in alignment. Means are also provided for relieving both ends of the teeth so the major load can be carried on the tooth crowns. A further development is a means of compensating for the deflection of the pinion when under heavy load. Master cutters are equipped with serrations on a single side, instead of on both sides, as on conventional tools.

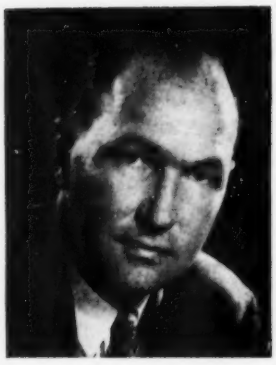
A completely new development has been the introduction of a technique for shaving turbine reduction gears while in position aboard ship, and correction of the pinions to suit. This has been performed successfully by the British Navy on destroyers and aircraft carriers, and has resulted in tremendous time and cost savings.

While emphasizing the developments in larger types of equipment, Sykes also indicated that there had been effective application of the new designs to small spur and helical gears, and mentioned that gears were now being hobbed and shaved to remarkably precise tolerances and at an extraordinarily high rate for aircraft jet engines.

A program now being carried on in cooperation with the British Admiralty concerns the development of a new type of creep hobbing machine designed to eliminate the rough finish produced by conventional creep hobbers and, at the same time, reduce and redistribute hobbing errors so high spots will not occur in harmonic frequency.

Kenneth C Spooner

Clarence G Rosensweig



Richard F Cooper

W E Benninghoff

Names in the News

Kenneth C Spooner has been named vice president of Simmons Machine Tool Corp. Mr Spooner has been a member of the firm for the past fifteen years; he has most recently been serving as sales manager.

J A Hill has been elected vice president and sales manager of Thor Power Tool Co. **John A McGuire,** chairman of the executive committee, has been named vice president in charge of labor relations; **B H Johns,** sales manager of the company's Contracting and Mining Division, is new vice president in charge of rock drill sales; **W B Hunn** has been appointed vice president in charge of the Los Angeles works.

Walter E Gunnerson has been elected vice president in charge of sales, Anderson Bros Manufacturing Co. He has been associated with the company for 27 years, most recently serving as sales manager and chief engineer.

R B Attridge has been appointed head of Ainsworth Manufacturing Corp's Manufacturing Engineering Division. Mr Attridge was formerly associated with the Budd Co, and Lustron Corp.

H M Rittger has been appointed general sales manager of Tool Steel Products, with headquarters at the Cincinnati plant. Mr Rittger will also supervise sales of bar and tube steel products in the area.

Bernard Anscher has been appointed sales manager for domestic sales of Hydropress, Inc, and its Loewy Rolling Mill Division.

Clarence G Rosensweig has been elected executive vice president of Fafnir Bearing Co. In his new position he will have authority over all divisions of the company and will assist the president in administrative and supervisory responsibilities. **Richard F Cooper,** formerly assistant works manager, has been named vice president and works manager, the post previously held by Mr Rosensweig.

E C Clark has been appointed director of operations, Air Reduction Sales Co; he was formerly assistant director of the research and engineering department. **L B Dobbins,** works manager of the Butler, Pa, liquid oxygen plant, has been named manager of plant engineering in New York, replacing **R E Lenhard,** transferred to the Ohio Chemical & Surgical Equipment Division, Madison, Wis, as vice president, manufacturing.

Robert L Orth has been appointed field sales manager of American Wheelabrator & Equipment Corp. **Julius E Skene** has been named manager of customer service and **Philip R Jordan** promoted to chief sales engineer. **Gordon R Bryant** succeeds Mr Orth as district manager of the Detroit office. **Wilfred G Carrie** will manage the Seattle office, succeeding **George C Tolton,** named to head the Greensboro, NC, branch.

William T Welch has been appointed president of Ajax Flexible Coupling Co. **Wayne Belden** has been named executive vice president; **Charles Belden,** vice president; **H E Northrop,** treasurer; **Robert G Cady,** secretary.

W E Benninghoff has been elected vice president of Ohio Crankshaft Co; Mr Benninghoff, who has been associated with the company since 1935, will continue to serve as general manager of Ohio's TOCCO Division. Vice President **Foster H Pettay** has been named to the additional post of secretary-treasurer.

A C Reppenhagen has been elected president of the Mid-West Abrasive Co. A member of the firm since 1944, Mr Reppenhagen had formerly been general manager of Experimental Tool & Die Co.

William F Mullins of Werdiger & Mullins Co has been elected president of the Industrial Diamond Association of America. **Piet Smit** of J K Smit & Sons was named first vice president, and **Walter J Meinhardt** of Meinhardt Diamond Tool Co was appointed second vice president.

Randolph J Roshirt has been elected vice president of Aluminum Industries, Inc. He will be responsible for integrating production and sales operations, and in charge of new product development. Prior to joining the company, Mr Roshirt was executive vice president and director of the Bohn Aluminum & Brass Corp.

Fred W Gollbach, president of Ace Tool & Die Co and chairman of the board of Ace-Central States Machine Tool Co, has been elected president of the Detroit Council of the National Tool & Die Manufacturers' Association. **Daniel Karpinski** of Westlof Tool & Die Co was named first vice president; **H E Hurkett** of Pattern Products Manufacturing Co is second vice president, and **H A Kramer** of Crosstown Manufacturing Co, secretary-treasurer.

Carl H Morken

David C Peterson

David MacGregor

Lester N Shannon, Jr

Carl H Morken, formerly works manager, has been appointed vice president in charge of manufacturing of Kennedy Valve Manufacturing Co, Elmira, N Y. Mr Morken was formerly plant manager for Donovan, Inc, and prior to that, was with Ohio Brass Co.

Siegfried Langner, plant manager of Langston Monotype Co, Philadelphia, has joined Fairchild Engine & Airplane Corp's Stratos Division, Bay Shore, L I, N Y, as factory manager.

Jouett Shouse of Washington, D C, ex-Congressman and assistant Secretary of the Treasury under Woodrow Wilson, has been elected chairman of the board of Anton Smit & Co, New York industrial diamond firm, succeeding the late L J A Smit.

Howard A Small has been appointed cutting tool and gage sales engineer in Pratt & Whitney's Los Angeles office. Named as cutting tool sales engineer in Pratt & Whitney's New York, Rochester and Philadelphia areas is **Michael M Munson.**

Charles R Van Riper has been named Chicago district sales engineer for the Norton Co. He will direct and organize field engineering activities in Chicago.

Jerold L Welch has been named assistant chief engineer of Reed-Prentice Corp, Worcester, Mass., manufacturers of die-casting and plastic injection machines.

E C Warrick, chief engineer of Rockwell Mfg Co's Delta Mfg Division, has been promoted to chief engineer of the firm's Power Tool Engineering Division. Mr Warrick joined Rockwell in 1945 as a design engineer for the Rockwell Register Division.

David C Peterson, director of engineering and manufacturing of Stewart-Warner Corp's Division One, Chicago; and **Lynn G Vanderhoof,** general manager of S-W's Die Casting Division, Chicago, have been elected vice presidents of the company. Walter F Herold, executive vice president of Stewart-Warner's subsidiary, the Bassick Co, Bridgeport, Conn, has relinquished this post to become vice president, engineering of the parent company, and will become S-W's corporate representative on the East Coast following a short leave of absence.

David MacGregor, chief engineer, Edward Valves, Inc, East Chicago, Ind, has been assigned the additional duties of works manager of the company and will supervise all manufacturing operations and industrial relations.

Lester N Shannon, Jr, has been named manager of Firth Sterling, Inc's southern district and will make his headquarters in Birmingham, Ala. Mr Shannon headed his own firm, Materials Handling Service Co, until he was recalled to active duty with the Navy in Japan a year ago.

OBITUARIES

Edward Payson Bullard, chairman emeritus of the board of directors of The Bullard Co, Bridgeport, Conn, died at his home in Fairfield, Conn, June 26 at the age of 80. Son of the company's founder, he was a graduate of Amherst College and entered the company's employ in 1892, when the plant employed 55 workers, as an apprentice machinist. He eventually became president of the company, serving in that capacity until 1946, when he became chairman of the board. He retired as board chairman two years ago.

He was a pioneer in industrial education and helped to found the Bullard-Haven Technical School in Bridgeport. He was president of the National Machine Tool Builders' Association 1911-1913. He was awarded a gold medal by the Franklin Institute in 1920, and in 1927 the American Society of Mechanical Engineers presented him with its medal for "outstanding leadership in the development of station-type machine tools." During his 61 years in the machine-tool industry, Mr Bullard was responsible for obtaining more than 60 patents.

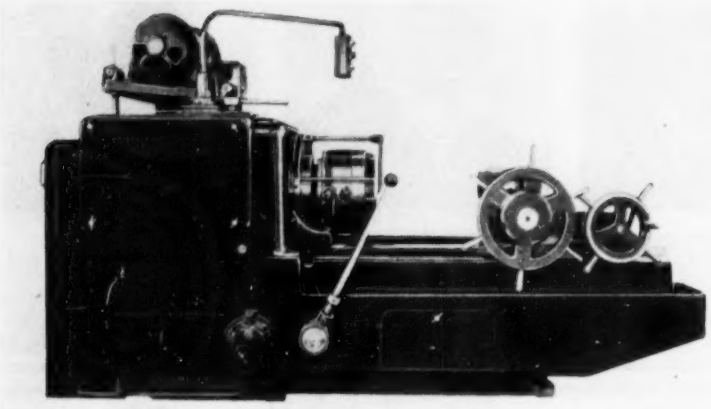
Francis S Denneen, 73, co-founder and secretary-treasurer, Ohio Crankshaft Co, Cleveland, died May 10.

Charles Edward Moore, 59, president of Moore Machinery Co, Moore Industrial Co, and Industrial Assets Co, all of California, died June 19 following a heart attack while riding horseback near La Honda, Calif. Former industrial chief of the ECA, and technical adviser for the OPM, Mr Moore served as State Department industry consultant in Greece, and Marshall Plan consultant in Italy. He was a director of the NAM in 1944-45.

L D Rigdon, 67, consultant to the manufacturing vice president of Westinghouse Electric Corp, died at his home in Pittsburgh May 24.

John R Hurley, 45, president of Thor Corp, and vice president of Meadows Corp, a subsidiary, died June 21 at Lake Forest, Ill. Mr Hurley, whose father founded the firm in 1906, joined it as secretary in 1929. He subsequently served as president of the Electric Household Utilities Corp, and the Hurley Machine Division of that company.

New Shop Equipment



Landmaco Machine Precision Threads Large-Diameter Work

Threading machine for heavy-duty precision threading on large-diameter work will cut bolt threads from 1½ to 6⅝ in. in dia and pipe threads from 1 to 6 in. in dia, up to 29 in. long with leadscrew and 30 in. without leadscrew. Pitch capacity ranges from 2 to 24 tpi.

At present unit is available in single-spindle model with or without leadscrew attachment. Machine bed is equipped with hardened and ground rectangular ways for supporting and guiding the carriage which is gibbed to provide wear compensation and operated by handwheel in connection with rack and pinion.

Carriage vise incorporates new design principle said to give 60% more gripping efficiency than previous vises. This feature, combined with hammer-blow handwheel used to operate the grips, reportedly provides greater gripping power with less effort.

Single gear-shift lever is provided for rapid speed change of 25% for any given spindle speed as determined by the speed-change gears in use. Three pairs of speed-change gears provide twelve spindle speeds ranging from 9 to 152 rpm.

Equipment includes either 4-in. standard rotary head or 6-in. Lanco head. Both die heads are said to provide rigid support for chasers.

Landis Machine Co, Waynesboro, Pa

Acro-Coolant For Use With Goodyer Acro Injector

Function of Acro-Coolant is to lubricate and to dissipate heat in all metal-cutting operations. Designed for use with the Goodyer Pur-O-Luber, the solution is reported to be extremely effective when carried by the compressed airstream. The injector, using Acro-Coolant, has a wide range of uses because it permits a variety of concentrations, specific gravities, and spray types by adjustment of the unit. Basic average ratio recommended is 1 part Acro-Coolant to 20 parts water (zero-soft).

Qualities claimed for Acro-Coolant solution are: super-oiliness, anti-welding, high film strength, low viscosity, heat dissipation, safety, odorless, smoke-less, non-rancid, non-rusting, and removable with water.

Acro-Coolant is a high-strength solution of high-molecular-weight hydrocarbon with chlorine bound into the molecular structure and stabilized by polymerization. Molecular weight is increased, eliminating the possibility of decomposition when being used. It is said to be the extremely large size of the molecule that imparts the high film strength and excellent lubricating properties.

Acro-Coolant is a true solution, not an emulsion. Cutting tool receives constant lubrication from the fully active solution.

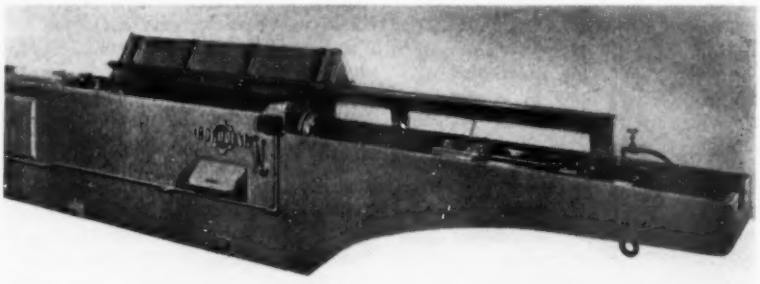
Air Conversion Research Corp, 4107 N Damen Ave, Chicago 11, Ill

G-E Type W-98 welding electrode is designed for build-up work and hard-surfacing application where deposited metal can be machined or flame-hardened. Rod can be used in all positions; uses ac or dc, and is manufactured in ⅛- to ¼-in. sizes.

General Electric Co, Schenectady, NY

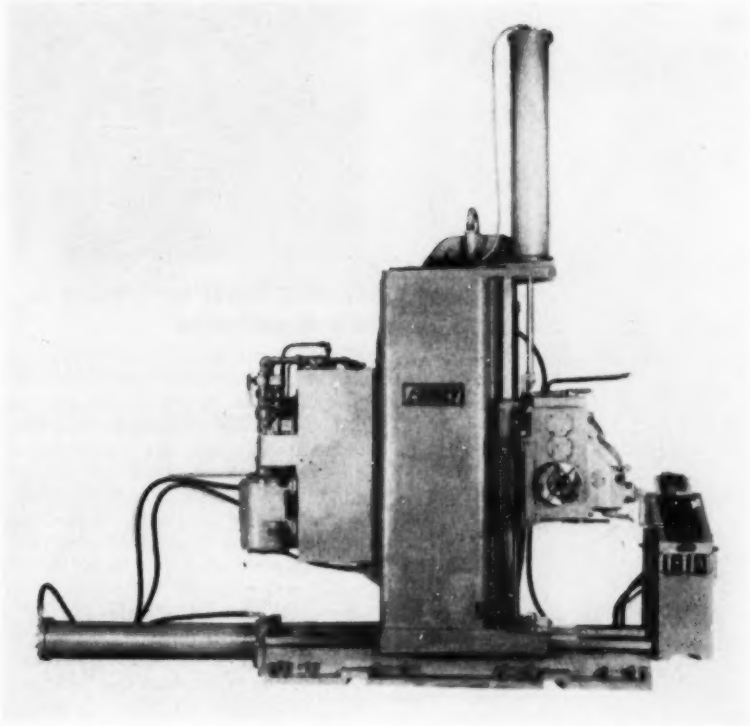
Air tacker with bumper trip, driving more than 200 staples per minute, has been added to the Heller line. Trip works on a cylinder principle to distribute 40- to 80-lb air pressure for swift, accurate driving. Unit loads a double bar of staples from 5/32 to 13/16 in. long.

Heller Co, 2153 Superior Ave, Cleveland, Ohio

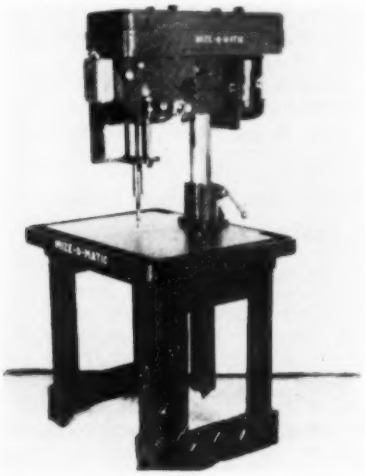


COLONIAL BROACH CARRIER RACK travels with ram of horizontal broaching machine to save time on operations requiring use of multiple broaches in sequence. After each pass, broach is removed and placed in rack; ram returns to starting position and next broach is inserted in puller — *Colonial Broach Co, Box 37, Harper Station, Detroit 13, Mich*

Materials and Parts



FACING AND BORING MACHINE handles complicated irregular profile milling and boring of aluminum or magnesium castings and forgings and cast and rolled armor plate. Spindle housing is motor-powered to move into the work face. Duplicator equipment with templets is incorporated in design — *Forney's Inc, New Castle, Pa*



Drill Unit Uses Hydraulically Controlled Air Power

Mize-O-Matic machine uses hydraulically controlled air power for automatic drilling, tapping, and indexing, or operating hopper feeds, without the use of limit switches or electric valves. Head is elevated hydraulically and has 24-in. travel and 360° swivel to permit large work to be drilled at back of machine.

Worktable is 26x35 in. with T-bolt slots in line with spindle. Spindle speeds are 435 to 3600 rpm or 300 to 2400 rpm. Motor is 2 hp.

Among the features of the machine are: rapid approach to parts of any thickness without preadjustment; intermittent cut control for tubing; deep-hole drilling with infinite increment selection; continuous cycling for lapping or honing; dwell for counterboring or rivet spinning; dead-drill approach with automatic motor cut-in; sensitive small drill control; leadscrew tapping attachment; and twin belts for heavy drilling.

Drill or tapping units may be purchased separately.

Mize-O-Matic Inc, 5718 St Jean Ave, Detroit 13, Mich

... INCLUDING

Vertical Milling Machine features handwheel control of overarm travel and head and turret rotation ..... page 182

Traveling broach rack employs small crane and hoist for lifting broaches ..... page 183

Open-yoke press incorporates features of standard shop press, handles work done on forcing press, and can be used as platen press ..... page 184

System of precision gaging uses 25-gage set with gages varying in 0.0001-in. increments around nominal size ..... page 188

Airline filter, adaptable to all standard airlines, lubricates pneumatic tools with oil-laden air page 194

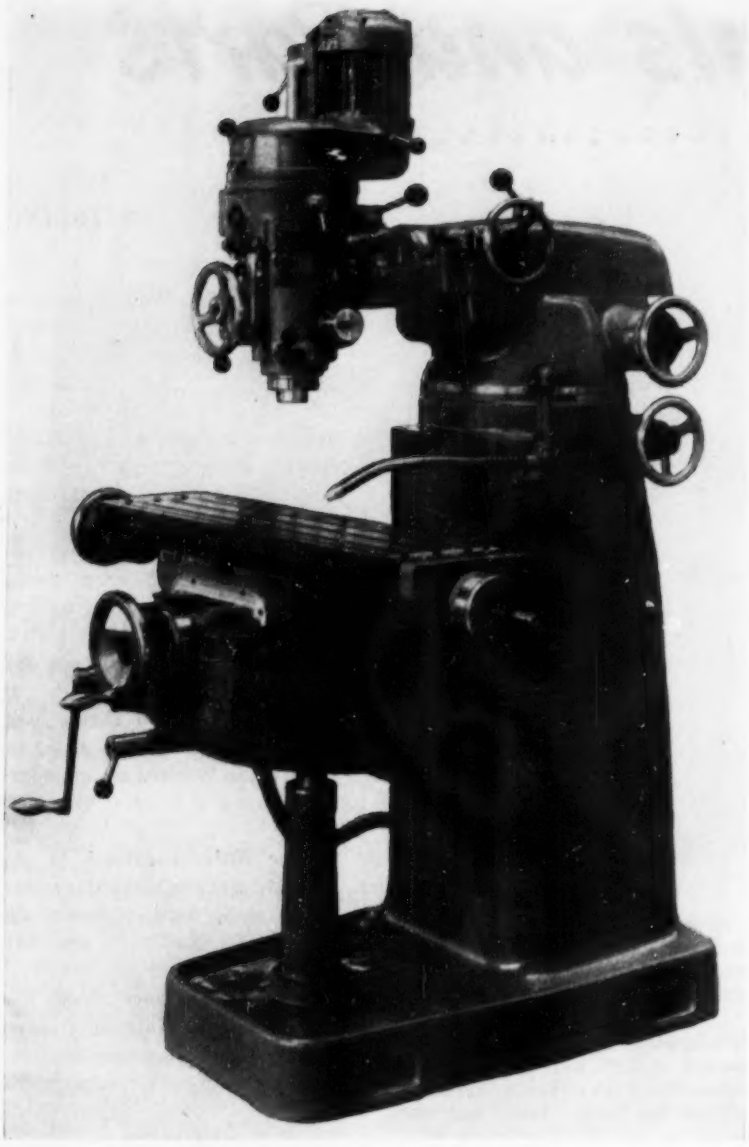
Portable groove gage checks dia and roundness of internal grooves over range of diameters to 5 in. page 196

Speed monitor, acting on tachometer principle, indicates speed, controls it within max and min limits, and actuates relays and solenoids ..... page 200

... and in July 20

Lathe and grinder center stores lubricant in grease cup, supplies it to the work through center-point jet.

Horizontal polishing machines, hydraulically operated, handle extrusions, sheets, and rods and have from 7- to 21-in. stroke.



Vertical Milling Machine Features Extensive Handwheel Controls

American Machinery Co vertical milling machine, reportedly manufactured at unusually low cost, features handwheel control of overarm travel and head and turret rotation. It is claimed that straight- to angle- or radius-cutting, boring, and drilling can be done without changing the setup for the designated work. Although not primarily designed for jig-boring, machine can reportedly replace a jig-borer in many instances.

Mill has heavy-column, 1-hp motor; 5½-in. quill travel; speeds up to 4100 rpm, 10x40-in. table; 10-in. cross travel, 24-in. longitudinal travel (which can be increased), 18-in. vertical travel, and 10-in. overarm travel; power feed of 0.0015, 0.003, and 0.006 in.

American Machinery Co, 3136 E Olympic Blvd, Los Angeles 23, Calif

Laboratory Jaw Crusher

Denver 3¼x4½-in. forced feed laboratory jaw crusher operates between 350 and 425 rpm and is powered by 2-hp motor. Capacity is 500 lb per hr for ¼-in. material. Jaw plates are manganese steel.

Denver Equipment Co, Box 5268, Denver 17, Colo

Locating Microscope Provides 30x Magnification

Perkin-Elmer Model 11 machine tool locating microscope provides 30x magnification, great enough to see 0.0001 in. When attached to a machine tool it aids the machinist in checking contours, slots, and surface conditions which cannot be accurately checked by mechanical measuring instruments. It is said to be especially suitable for work where holes are too small and contours too irregular to approach with an indicator.

Designed to be mounted in the machine spindle or on an offset bracket, the locating microscope can be adapted to nearly any machine tool. A roof prism is incorporated into the optical system to erect the image. All table movements made by the operator appear in the true direction.

The field of vision includes ¼ in. of the work. This simplifies picking up the reference point and enables the operator to visualize the relationship of various contours.

Microscope components are assembled in a cast aluminum housing.

The Perkin-Elmer Corp, Norwalk, Conn

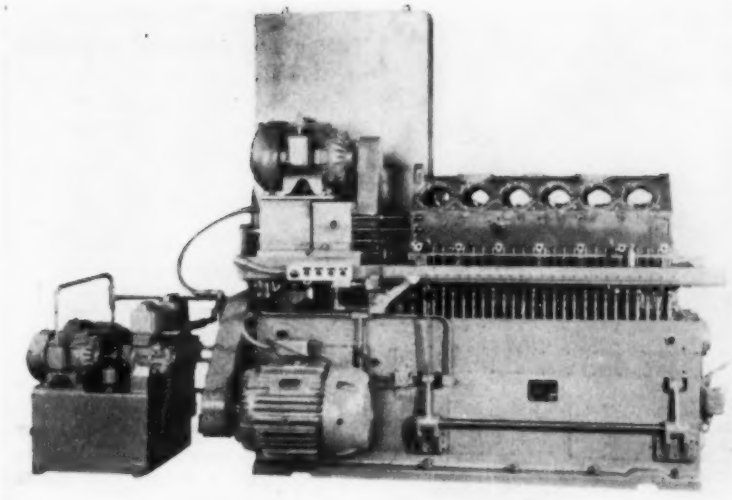
Arc-Welding Electrode Holder Is Cooler and Lighter

Design of Welding Products electrode holder places jaw lever close to handle giving it less tendency to roll; squeeze of the hand releases electrode stub.

Features include fully enclosed spring and patented spring adjustment, reversible jaw insulators that can be reconditioned on the line, channel construction and compound cam and lever action for parallel opening of the jaws.

Unit is available in 200-, 300-, and 500-amp capacity models.

Welding Products Div, A O Smith Corp, Box 584, Milwaukee, Wis



Moline 56-Spindle Machine for Back-Spotfacing Operations

Moline Model MR 137 56-spindle machine back-spotfaces two parallel lines of 25 holes each in pan rail face and 6 holes in accessory end of aluminum crankcase for internal combustion engines.

Crankcase is set on hardened and ground rest plates on table of machine where it is positioned by locating pins and clamped into place. Table is lowered by hydraulic power so that the 50 cutter drivers extend upward through previously drilled holes in pan rail. At the same time, 6 cutter drivers for accessory end are moved into working position so they extend through holes that are to be back-spotfaced. These six spindles are on a separate hydraulic feed unit that moves up and down with main table. Cutters, each having bayonet-type lock, are manually placed on the drivers.

With all cutters in position and positive stops in place, spindle rotation is started by pushbutton and then automatic hydraulic feed cycle is initiated in same manner. Feed cycle includes adjustable timed dwell against the positive stops so that all spotfacing cuts will be of correct depth. Following the dwell, reverse travel returns work and cutters to position where cutters are removed from spindles prior to withdrawal of cutter drivers and unloading of crankcase from fixture.

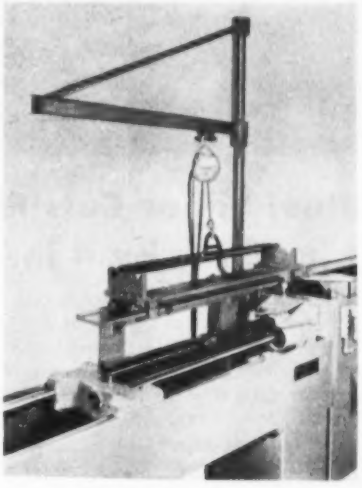
Moline Tool Co, Moline, Ill

Pressed steel bench legs have been introduced to permit construction of custom-made benches in any length. Electrically welded units do not require wall support; under-shelf and bin construction can be installed without loss of rigidity. Available in single, double, or wall models.

Industrial Bench & Equipment Manufacturing Co, 97 South St, New Britain, Conn

Powrite is a rust-inhibiting metal cleaning compound for use in mechanical power washing equipment for removing oil, dirt, chips, and abrasives from all types of metal surfaces. May be applied in washers, tanks, or spray booths. Product is dust-free, granular, and water soluble; rinsing after cleaning is unnecessary.

Whitfield Chemical Co, 14225 Schaefer Highway, Detroit, Mich

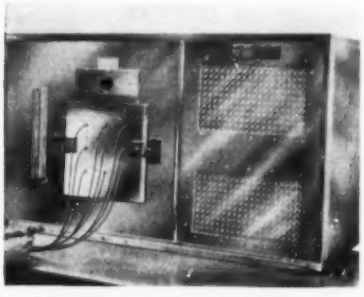


Colonial Traveling Broach Rack Uses Small Crane and Hoist

Traveling broach rack employs small crane and hoist for lifting the broaches. Shuttle rack, roller-mounted, is connected with broach ram and moves with it. When broaching pass is finished, rack is immediately above broach to be removed. Broach is hoisted to rack by first swinging crane arm into position so padded hooks on hoist can pick up broach and place it in rack.

Ram returns to loading position with rack following; crane swings around to pick up next broach from rack and lowers it into broaching position; broach is then attached to puller for next pass.

Colonial Broach Co, Box 37, Harper Station, Detroit 13, Mich



Webber Temperature Test Chamber Designed For Rapid Drop

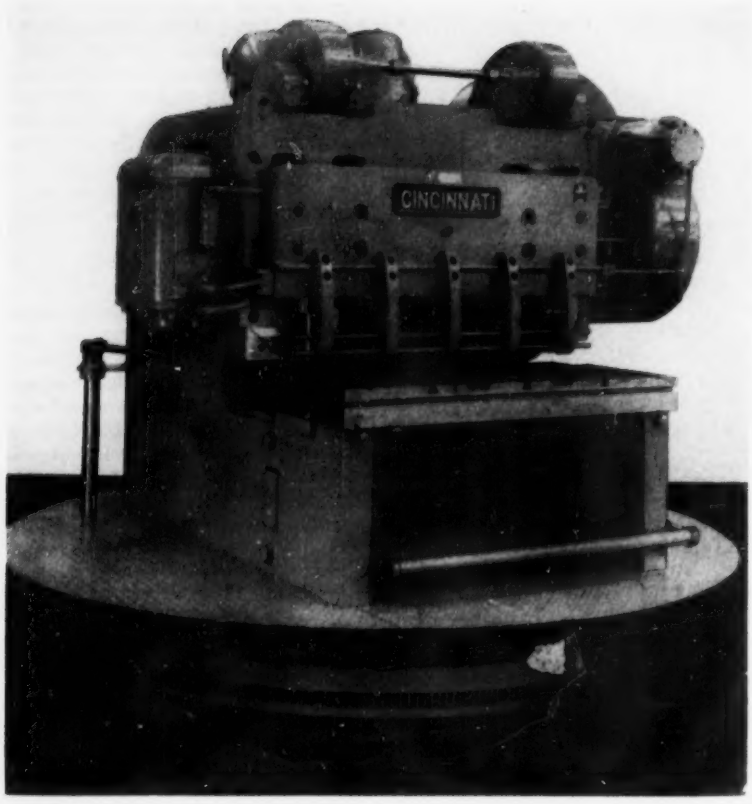
Webber high-low temperature bench-type test chamber is said to be capable of attaining extreme temperature ranges within a relatively short period of time. Standard model temperature range is –80 F to +185 F; pull-down to –80 reportedly requires less than 30 min.

Test chamber dimensions are 12x12x12 in. Cabinet is stainless steel. Application of heat is accomplished through the use of reverse-cycle refrigeration, eliminating the hazards associated with open heating elements. Blower is furnished for even distribution of temperatures.

Latch-type door can be completely removed from cabinet to provide for use of mounting board on back of door. Holes may be drilled through door for electrical contacts.

Similar chamber is available for temperature range from –100 F to –250F with same chamber size.

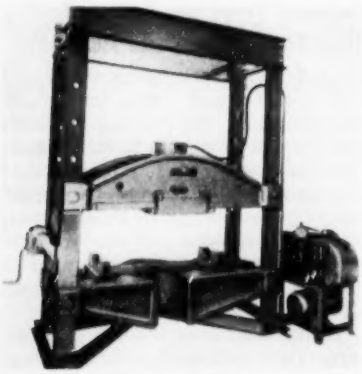
Industrial Freezer Div, Webber Mfg Co, Inc, Dept 00240, 2740 Madison Ave, Indianapolis 3, Ind



Steel Shear Cuts Pieces 1 in. Thick by 4 in. Long

Cincinnati all-steel shear is capable of cutting mild steel up to 1 in. thick and 4 in. long. Shear is mounted on a turntable rotated by means of circular rack and pinion and can be turned 90° either side of center. Operation rate is 30 spm. Hinged-back gage angle permits cutting plates longer than back-gage range. Weight of machine is 42,000 lb.

The Cincinnati Shaper Co, Hopple, Garrard & Elam St, Cincinnati 25, Ohio



Rodgers Open-Yoke Press Does Work of Three

Open-yoke press incorporates all features of standard shop presses, handles most work done on forcing presses, and, because of a fully machined yoke bed, can be used as a platen press.

Capacities are 100, 200, 300, and 400 tons. Machined V-blocks are centered in yoke-member groove. Wear collar is supplied for inserting in yoke recess as well as a bedplate insert to cover recess and provide flat working surface. Yoke recess takes standard yoke adapters.

Other features include: movable cylinder with locking device to provide full pressure across width of press, clear open ends to permit entrance of material, hand-operated winch to raise or lower bolster, and choice of hand- or power-operated hydraulic pumps.

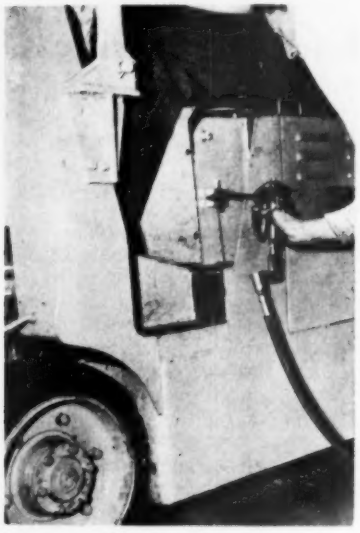
Rodgers Hydraulic, Inc, 7450 Walker St, St Louis Park, Minneapolis 16, Minn

Stacker Crane Combines Fork Lifting With Overhead Suspension

Whiting Tranbeam stacker crane combines the functions of fork lifts and overhead crane suspension and is designed primarily to expedite handling of drums, dies, motors, chemicals, and paints. Stacking mast, with fork lifts, is rigidly suspended from a double-girder Tranbeam crane, the mast requiring only one foot of clearance in addition to the width of the load.

Use of the overhead suspension permits complete flexibility of travel with mast rotating 360°. Lifting power is supplied by double-drum hoist. Crane motion may be hand-powered or motor-driven and controlled from a pushbutton on the mast.

Whiting Corp, Harvey, Ill



Mercury Lift Truck Features Alemite Centralized Lubrication

Mercury Yak Model 430 fork truck (*AM*—May 25 '53, p184) features the Alemite centralized Accumeter lubrication system. The entire trail axle and steering assembly can be lubricated in a few seconds at the lubrication block inlet without forcing the driver to leave his seat.

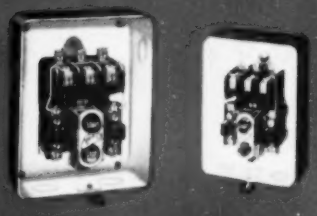
Lubricant flows through branch lines to measuring valves located at the bearings. Valves measure out an exact shot of lubricant, accurate to 0.005 cu in. System is totally enclosed; lubricant fully protected.

No special equipment is required; power-operated pumps or hand guns can be used.

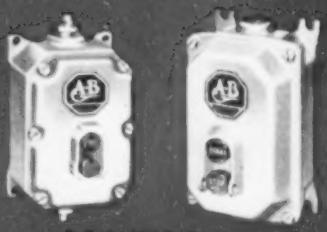
Accumeter centralized lubrication can be applied to almost any machine.

Mercury Manufacturing Co, 4044 South Halsted St, Chicago 9, Ill

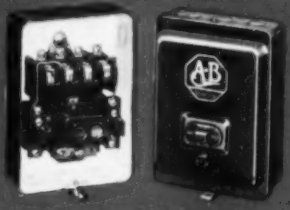
Bulletin 600
Starting switch for small motors.—With or without pilot lights.



Bulletin 607
Manual starter for a-c motors.—Up to 5 hp, 220 v; 7½ hp, 440-550 v.

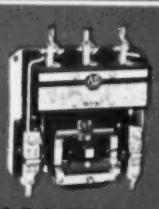


Bulletin 609 Enclosures
NEMA Type 7 for hazardous gases.—NEMA Type 4 for watertight duty.



Bulletin 709 Solenoid Starter
Form 1—Push buttons in cover
Form 2—Without push buttons
Form 3—With 3-way selector

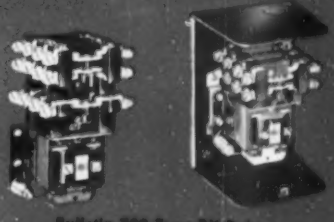
Bulletin 709 Solenoid Starter
Size 2—NEMA Type 1 steel enclosure.



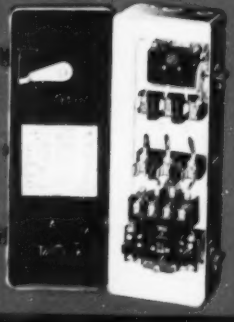
Bulletin 709 Starter
Size 4—Open type.

Bulletin 709 Solenoid Starter for motors up to 300 hp, 220 volts; 600 hp, 440-550 v. These starters are available in enclosures for any industrial service.

Bulletin 700 Type C
small 2-pole relay.

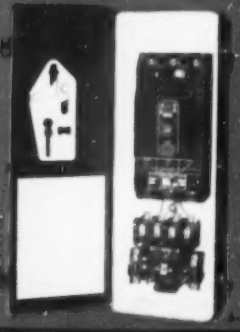


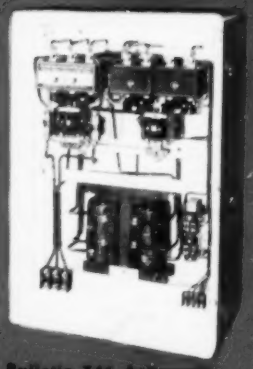
Bulletin 700 Type BX Relays
8-pole open.—4-pole enclosed.



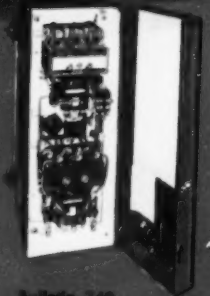
Bulletin 712 Combination Starter with manual disconnect and fuse clips. (Left)

Bulletin 712 Combination Starter with ITE circuit breaker. (Right)





Bulletin 746 Autotransformer Starter for squirrel-cage motors.



Bulletin 740 Automatic 2-Step Resistance Starter. Starters also available in 3 steps or for stepless acceleration.

THE QUALITY SIGN in Motor Controls

The A-B trademark is recognized, everywhere, as a symbol of QUALITY in motor control and a guarantee of trouble free performance in all types of industries. Allen-Bradley engineering progressiveness blazed the trail of the solenoid starter. And Allen-Bradley still leads the field with solenoid starter performance in 8 sizes—up to 300 hp, 220 v; 600 hp, 440-550 v. Such leadership assures you maximum production from your motorized machines.

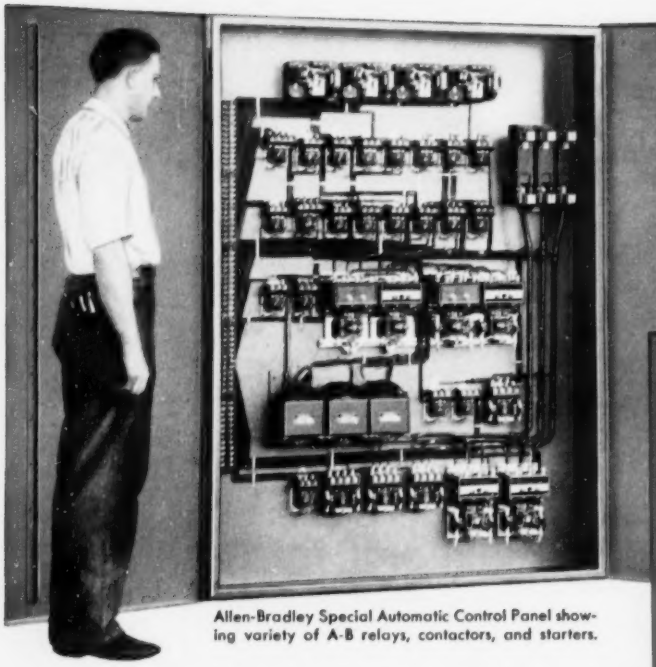
Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

ALLEN-BRADLEY

TROUBLE FREE MOTOR CONTROLS

QUALITY

3-33-B



Allen-Bradley Special Automatic Control Panel showing variety of A-B relays, contactors, and starters.

A-B Quality

Let this

TRADEMARK

be your guarantee of

TROUBLE FREE OPERATION

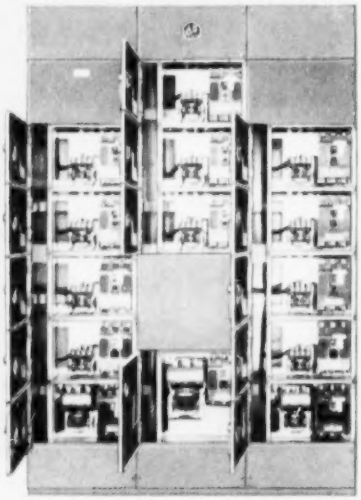
for Large or Complex Control Installations

Are you looking for efficient and trouble free starters for large motors, or do you have a complicated control problem?

If so, you can be assured of the most modern and dependable equipment by calling in your nearest A-B control engineer. He has the experience and know-how to select the *right* combination of motor controls for each application.

Allen-Bradley controls are simple in design . . . hence more dependable and trouble free. The A-B trademark is a guarantee of QUALITY that safeguards manufacturing schedules. We shall be glad to send you an illustrated bulletin describing the Allen-Bradley line.

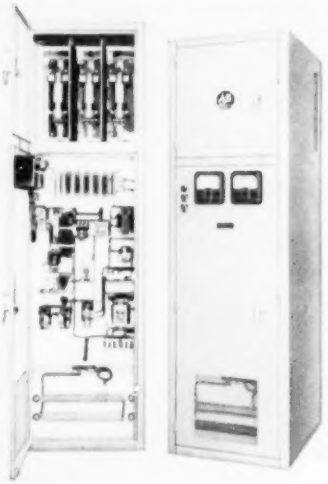
MULTI-UNIT PANELS FOR CENTRALIZED MOTOR CONTROL



Many modern plants concentrate their motor controls in a centralized group of panels . . . all enclosed in a sectionalized steel control center.

For full particulars about Allen-Bradley Multi-unit Control Centers, please ask for Bulletin 798. Units can be removed or changed without disturbing the other controls.

STARTERS FOR LARGE LOW & HIGH VOLTAGE MOTORS



Manual or automatic starters are available in the Allen-Bradley line of motor controls for large low voltage and high voltage squirrel cage and synchronous motors.

Manual or fully automatic starters with any special feature, such as indicating lights, can be furnished. For complete data, send for illustrated bulletins.

Allen-Bradley Co.
1316 S. Second St., Milwaukee 4, Wis.

ALLEN-BRADLEY

TROUBLE FREE MOTOR CONTROLS

6-53-R

OSBORN

Osborn wire brush, automatically located, removes zinc chromate from around rivet holes in aircraft production.

Which of these versatile brushes will cut your costs?

Hard-to-get-at jobs are simplified . . . costly hand operations are eliminated . . . when you switch to one of these special-purpose Osborn power brushes.

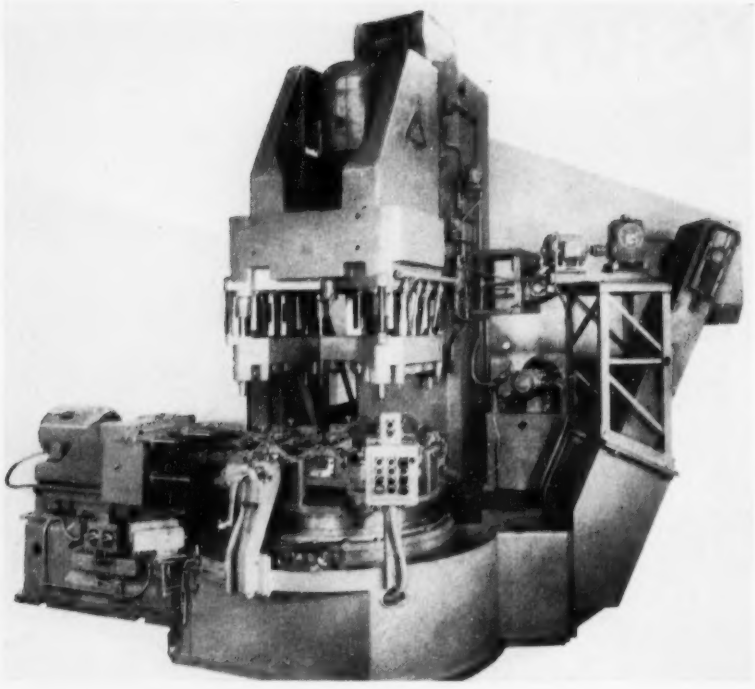
These versatile wire brushes are just a few of the complete Osborn line of power brushes for every need. Your **O**sborn **B**rushing **A**nalyst will gather necessary facts in your plant . . . study your production equipment and recommend the most efficient, economical power brushing techniques.

The small Osborn brush shown in operation enables one man to do the work of seven men. Output per man went up 700% in this aircraft application of removing zinc chromate priming from around rivet holes in wings and fuselages. Formerly this job was done by hand with small sandpaper discs.

Such results are duplicated every day by **O**sborn **B**rushing **A**nalysts. They can solve *your* brushing problems of product cleaning, burr removal, roughing, polishing or finishing with similar startling economies. For complete information at no cost, call your nearby Osborn representative or write to *The Osborn Manufacturing Company, Dept. C-7, 5401 Hamilton Ave., Cleveland 14, Ohio.*

Osborn Brushes

OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES



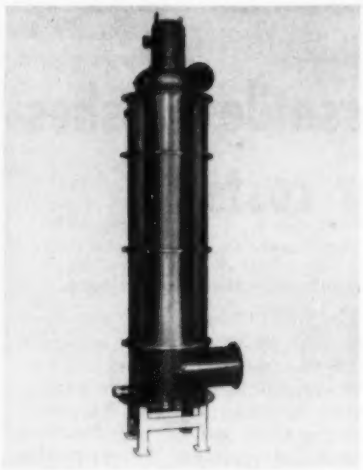
Drilling and Reaming Machine For Use on Tractor Track Links

Lemaire 2-way drilling and reaming machine for use in machining tractor track links has 4-station automatic indexing table. Machine has fabricated base. At left is mounted a No. 7½ HS hydraulic slide-type of unit with 4-spindle drilling head and at rear is a vertical column on which is mounted a No. 30 VS slide-type hydraulic feed unit carrying 10-spindle drillhead. At RH side is special chip-unloading conveyor. Automatic hydraulic indexing table has four fixtures in each of which is loaded one RH part and one LH part. Production is reported as approximately 45 pieces per hour.

Lemaire Tool & Manufacturing Co, 2657 South Telegraph Rd, Dearborn, Mich

Cold chisels and steel punches have been added to the Billings line. Standard size chisels with cutting edges ranging from 1/4 to 1 in. have octagon shank; extra long units are available with cutting edges in the 5/8- to 1-in. range in lengths of 12, 15, and 18 in. Punch styles offered: center, prick, solid, pin, extra long pin, and long taper units, in all standard sizes and diameters.

The Billings & Spencer Co, Laurel St, Hartford, Conn



Fume Washing Tower Has Tygoflex Plastic Coating

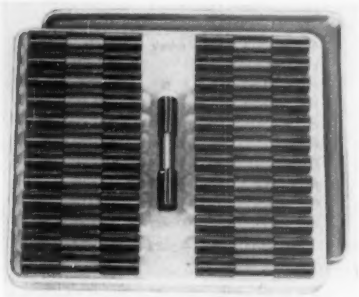
Fume washer for general laboratory and industrial use consists of metal stand on which tower is supported, bottom section containing packing support plate, liquid drain pipe and fume intake duct, one or two or more packed intermediate sections, distributor section with water inlet, and top section containing exhaust fan, drive motor, and washed-air exhaust duct for direct discharge.

Fume-laden air is drawn into the tower through the large air intake and sucked up through the intermediate sections filled with Intalox Saddle packing. (Extremely high efficiency and low pressure drop is claimed for this packing.) Water admitted at city line pressure is sprayed over packing by distributor. Rising air is scrubbed by descending water and discharged from the top exhaust.

All metal surfaces are protected from corrosion and abrasion by a 1/16-in. coating of Tygoflex plastic. This coating on the tower flanges makes an airtight seal between sections without the use of supplementary gaskets other than edge taping of the flanges with plastic tape.

Unit is made with 20- or 30-in. tower diameter.

US Stoneware Co, Akron, Ohio



Plug Gage Set Features Standardized Plugs

Deltronic Corp system of precision gaging uses a 25-gage set. One gage is nominal size, 12 are increasingly larger in 0.0001-in. increments, and 12 increasingly smaller in the same increments.

Gages are being used both as work gages and inspection gages; can also serve as layout pins because the 0.0001-in. variation assures snug fit in bores.

Cost of set is said to approximate that of one GO-NO GO gage. Each gage is the same size on both ends. Each set comes in plastic case and is now available with any nominal size from 1/8 to 1 in., in increments of 1/64 in.

Deltronic Corp, 9010 Bellanca Ave, Los Angeles 45, Calif

Chucks for jet-engine machining are now being produced for such parts as shroud rings, rotor compressor disks, and other thin-walled sections with suitable holding means.

E Horton & Son Co, Windsor Locks, Conn

Take the load off your

Radials and Uprights

with the NEW

LELAND-GIFFORD No. 3 MVB

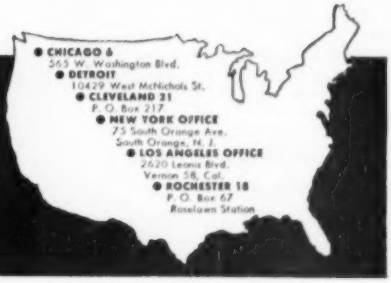
24" SWING — HEAVY DUTY

DRILLING MACHINE

Many a radial or heavy duty upright is now burdened with operations which can be performed with greater speed, economy and efficiency on the new Leland-Gifford No. 3 MVB. Rugged, powerful, versatile, it will handle holes up to 1¼" in steel or 1½" in cast iron. Available with one to four spindles; power, hand or hydraulic feed; two or eight speeds with single or four speed motor and back gearing — it is adaptable to any general purpose or mass production drilling, tapping, reaming and counterboring assignment.

Look into the Leland-Gifford No. 3 MVB. It will not only pay for itself quickly — but give you an extra bonus by taking the load off more costly equipment.

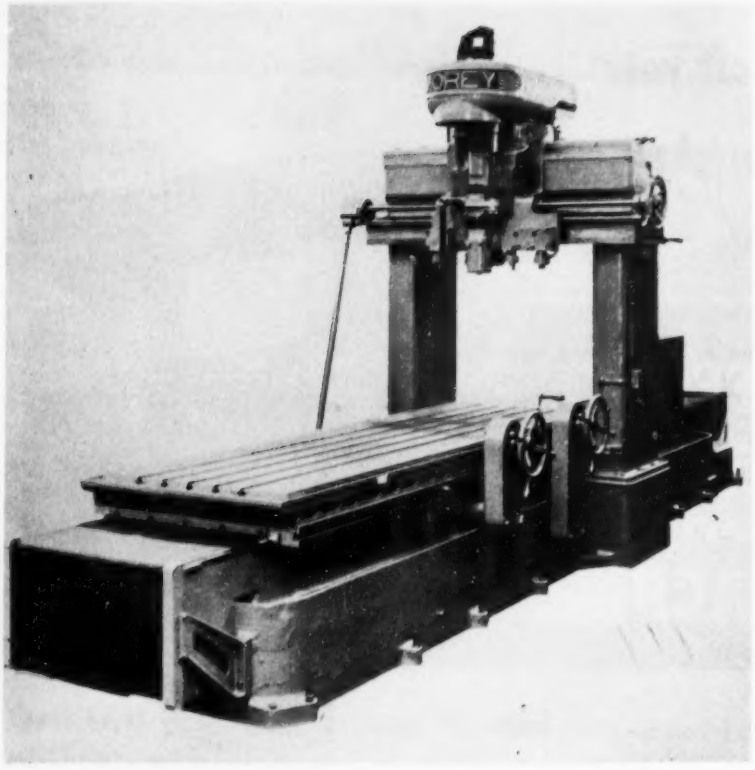
Write for Complete Information



LELAND-GIFFORD

Drilling Machines

WORCESTER 1, MASSACHUSETTS, U.S.A.



Machine For Milling and Profiling Large Castings

Morey Machinery has brought out an additional model of the Aeroframe profiler and milling machine said to be especially suitable for use on large forgings and castings, such as aluminum and magnesium airframes as well as cast iron parts and steel forgings.

New model has 10-ft table with full support bed, is equipped with 2-speed 15-hp motor operated through back-geared drive to provide spindle-speed range of 125 to 4600 rpm.

Incorporated are such features as: cross head mounted on vibration-dampened crossrail; heavier bridge column; and provision for fitting with hydraulic following attachment.

Morey Machinery Co, Inc, 410 Broome St, New York 13, NY

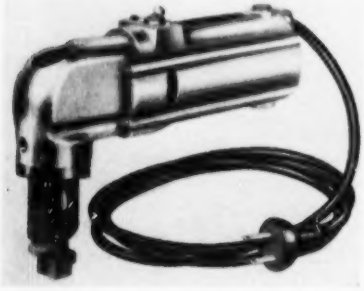
Tap-Go Spring Center Frees Both Hands For Tapping

Tap-Go spring center enables operator to tap holes squarely and in precise location at the same time the work is drilled. Center was designed to telescope ⅜ in. while being used in a standard ½-in. drill chuck. Alignment is maintained through the full travel of the center in its housing.

Device does not have to be fed down with the tap; spindle is lowered onto the tap, the spring is loaded and tapping is done with both hands, thereby maintaining even pressure. After tapping ⅜ in. it is necessary to repeat for further depth.

Center can be used on jig borers as well as lathes, vertical millers, and drillpresses. Price: $7.50.

The Medelton Co, Inc, 335 E 142nd St, Bronx 54, NY



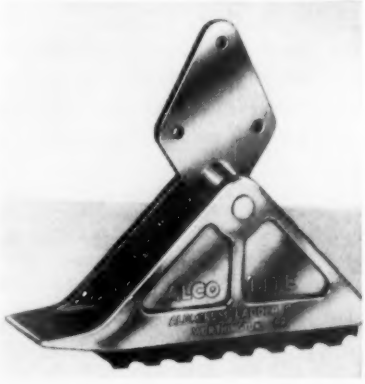
Improved Model of Little Wonder Nibbler

New model of Little Wonder nibbler reportedly has greater rigidity and durability because of a nosepiece which incorporates a punch and die arrangement for cutting metals, including stainless steel, up to 14 gage.

Durability of motor has been increased and specially designed fan has been added; new-type bearing in drive shaft gives longer wear and greater punch life; three-conductor cable has been provided and unit is available with 220-v universal motor besides the regular 110-v motor.

Nibbler makes it possible to cut holes in tubes and ducts without damaging original contours because cutting pressure is applied only to the metal being cut. Unit can be used as hand tool or vise-mounted for production work.

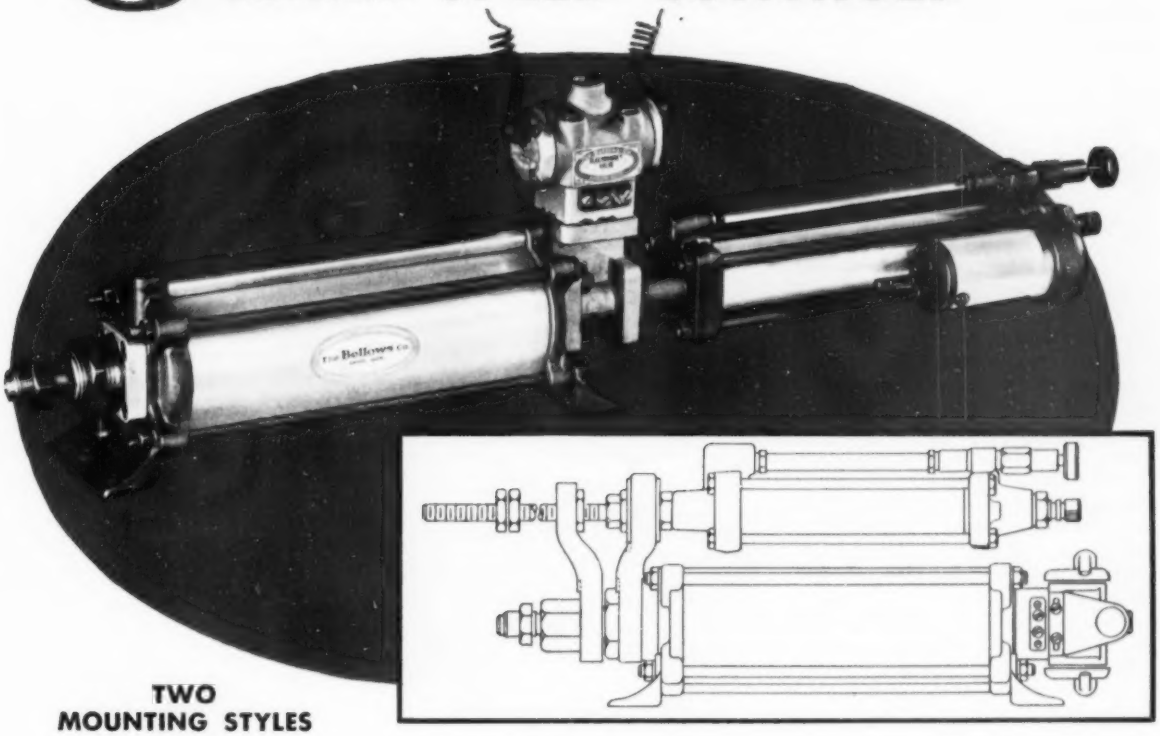
Fenway Machine Co, Inc, Philadelphia 3, Pa



ALUMINUM SAFETY SHOE for straight and extension ladders can be used with rubber tread or spike. Attachable to almost any metal or wooden ladder, shoes sell for $4.50 per pair — *Aluminum Ladder Co, Worthington, Pa*

This Air Cylinder Combines

1 BUILT-IN HYDRAULIC CONTROL
2 BUILT-IN ELECTRIC CONTROL
3 BUILT-IN SPEED CONTROLS



TWO MOUNTING STYLES

The Bellows Air Motor and Hydro-Check (Model HCB-EM) is available arranged in tandem as shown above, or in parallel, as sketched.

●

Combination units of Air Motor and Hydro-Check are also made with any one of six other Bellows directional valve arrangements; and, of course, Air Motors and Hydro-Checks are available as separate units.

In one compact packaged power unit are built-in controls to cover every phase of air cylinder operation. Built-in hydraulic control of piston rod movement gives the characteristic smoothness of hydraulic operation, yet retains the speed and flexibility of air power. Built-in electrically controlled directional valve permits quick, positive, remote control, or easy electrical synchronization with other machine elements. Built-in speed controls permit exact control of piston rod speed in either or both directions.

This combination of Bellows Air Motor and Hydro-Check is available in five bore sizes: 1¼", 1¾", 2½", 3⅝" and 4½" in standard stroke lengths up to 18".

Here is air cylinder power at its best — fast, flexible, safe, and smooth.

BULLETIN CL-50 TELLS THE STORY. WRITE FOR IT TODAY!
DEPT. AM753

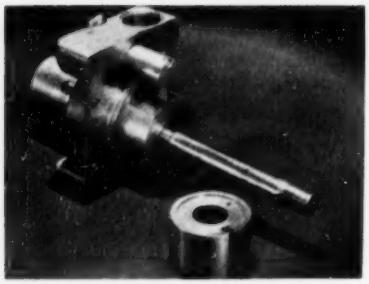
Controlled-Air-Power

The Bellows Co.

AKRON 9, OHIO

699-A

FOR FASTER, SAFER, BETTER PRODUCTION



Eco Bronze-Impeller Pump Handles Variety of Lubes

After two years of field tests, Eco Engineering has developed a bronze-impeller, positive-displacement pump for handling oils and greases at temperatures up to 500 F. Range of lubricating fluids includes light-bodied fluids such as petroleum lubricating oil, castor oil, fish oil, glycerines, peanut and cotton seed oil as well as the heavier diesel lubes, fuel oil, lard, oleos, and rendered fats. Max capacity is 10 gpm.

Positive-displacement delivery is achieved by two axially oscillating impellers which deliver continuous, non-surging flow without foaming or air-entrainment. Precision-machined, sintered-bronze-powder metal impellers act like oilless bearings working in a lubricating medium because they absorb and retain oils.

Pumps are self-priming at low temperatures. Their operation is said to provide high efficiency with less hp and smaller motors.

Unit will pump in any direction and position and may be operated submerged.

Eco Engineering, Newark, NJ

Versa Products Adds Larger Size Valves to Its Basic Line

Larger-capacity basic valves have been added to the ⅛ and ¼ NPT size pneumatic and hydraulic valves manufactured by Versa Products Co. New valves, ⅜ and ½ NPT size, are available in two-, three-, and four-way types and use the same actuating devices as the smaller valves. Hand, cam, pilot, or foot actuating devices, with or without spring return, can be used singly or in dual combination.

All internal parts are interchangeable between the three valve types and all valves can be disassembled without disturbing pipe connections.

Anti-extrusion arrangement of kinetic O-rings is said to assure air-tightness after more than 3,000,000 cycles of operation and make it impossible to cut the seal rings under normal operating pressures from 0 to 200 psi.

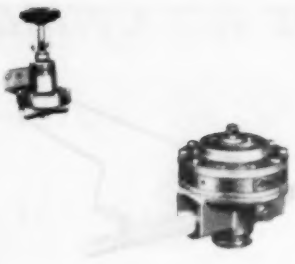
Versa Products Co, Inc, 249 Scholes St, Brooklyn, NY

Liquefied Petroleum Fire Pots and Torches

Fire pots are designed for double-duty service as either bench-type or tank-type units. Tanks are ICC-approved, are available in 11- and 20-lb sizes. Fire-pot features include cast aluminum base, steel supporting posts, cast iron burner with wide flame range, brass assembly parts, one-hand operation of flame control valve, one-piece steel hood, and permanent windshield. Operation is at full tank pressure and does not require a regulator.

Torch comes with three interchangeable all-brass burners: needle point, medium, and large. All types have removable orifice blocks.

The Turner Brass Works, Sycamore, Ill



Air-Pressure Regulator Is Pilot-Controlled

Norgren pilot-controlled air-pressure regulator was designed for extreme precision in air control over a wide operating range—from 2 to 120 psi with capacity to deliver more than 200 cfm.

Pressure regulator can be placed where it will be most effective and the separate pilot-control regulator can be installed wherever convenient. Connection between pilot-control and pressure regulator is provided by 3/16- or ¼-in. tubing.

The pilot-controlled regulator utilizes regulated air pressure to control delivered air pressure, minimizing the effect of fluctuating line pressure. Light adjusting spring in pilot-control regulator is said to make regulation easy and precise. Unit is available in ½-, ¾-, and 1-in. sizes.

C A Norgren Co, 3436 S Elati St, Englewood, Colo

Aro Blow Gun Meters Air Pressure

Blow gun is designed with throttle valve to meter air pressure with finger-tip control. Gun is readily adapted to requirements for cleaning jobs in shops, foundries, paint shops, machine shops, and others. Air can be regulated from whisper to blast; valve can also be set for fixed pressure.

Aro Equipment Corp, Bryan, Ohio

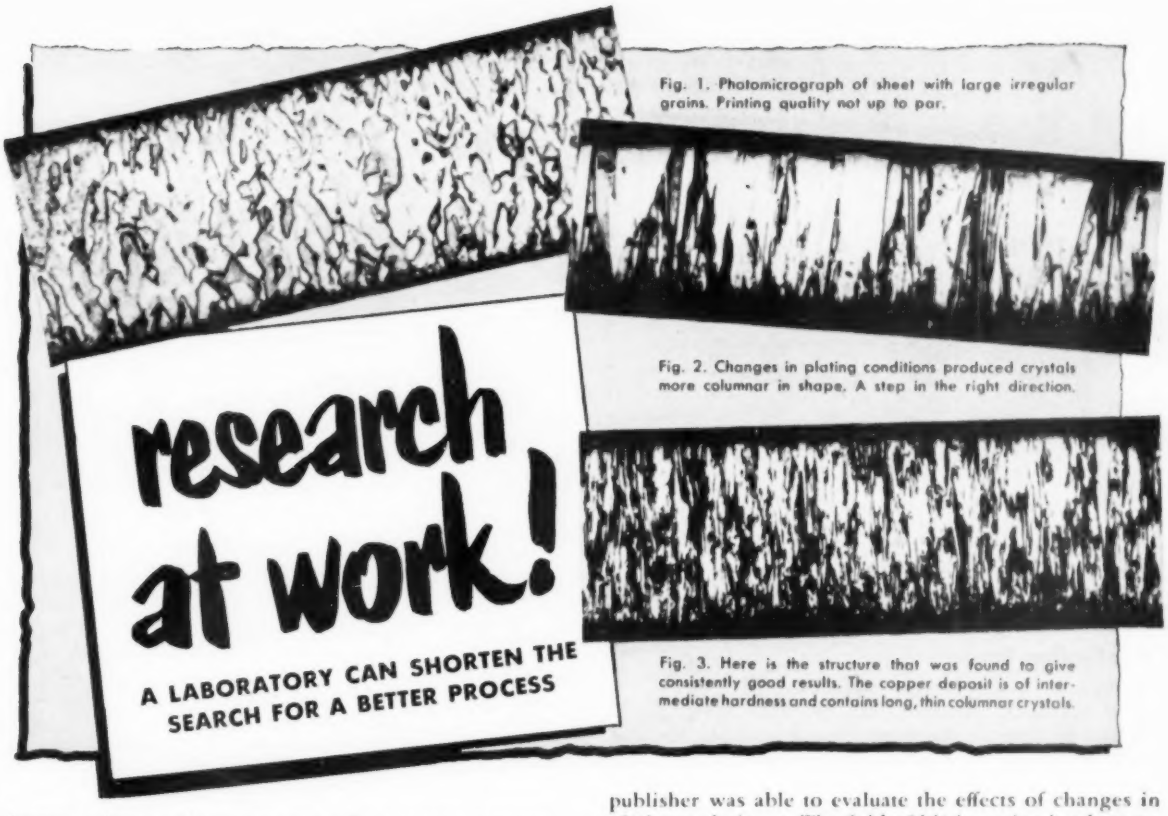


Fig. 1. Photomicrograph of sheet with large irregular grains. Printing quality not up to par.

Fig. 2. Changes in plating conditions produced crystals more columnar in shape. A step in the right direction.

Fig. 3. Here is the structure that was found to give consistently good results. The copper deposit is of intermediate hardness and contains long, thin columnar crystals.

research at work!

A LABORATORY CAN SHORTEN THE SEARCH FOR A BETTER PROCESS

Copper, a basic and important requisite for the printing of Sunday magazines for metropolitan newspapers, has—since the introduction of rotogravure printing process in the United States—suffered from cylinder wear marks which have kept the industry puzzled, and often resulted in defective printing to such an extent that blemishes in printing were easily discernible to the eye—and although not too disfiguring, there remained the necessity for their elimination for the purpose of perfecting the gravure printing operation. In collaboration with a publisher, owner of one of the most modern plants in the world, Revere Copper and Brass solved this perplexing problem and is continuing to contribute to the technical improvement of the rotogravure printing process.

In preparing cylinders for printing roto sections, copper is plated on them before engraving. The electroplating of copper is rather an old process, and its techniques are well understood. By varying current density and composition of the solution, many different types of copper deposit can be obtained. But which of the various methods would give the best results in this case? Rather than engage in a lengthy process of trial and error, the publisher, who felt that the crystal structure of the deposited copper held the key, asked us if we would collaborate.

What Were the Crystals Like?

Sheets of copper resulting from different plating techniques were sent to Research, which not only made photomicrographs of the grain structure, but also determined tensile strength and hardness. As was expected, there were large variations. Some specimens had large and irregular crystals; in others, they were long and thin, like fibers standing on end. In tensile strength, the range was from about 31,000 to 56,000 p.s.i. Diamond Pyramid hardness numbers ran from 62.9 to 141.5.

Over a period of time five different sets of samples were submitted to the laboratory, which made detailed reports on each. By correlating these with his own records, the publisher was able to evaluate the effects of changes in plating techniques. The field of his investigation became narrower after each laboratory report, and in the end it was possible for him to obtain medium-hard, fine grain deposits which require little grinding and polishing. These results now are duplicated daily on a commercial basis. Today the publisher is noted for the exceptionally fine printing quality of his rotogravure sections. The newspaper is The Inquirer, Philadelphia, Pa.

If You Do Not Have a Laboratory

This is an outstanding example of the value of applied research. Many companies occasionally need information that can only be supplied by a laboratory, but are not justified in spending the large sums required to buy and maintain scientific equipment, and to employ qualified research personnel. These firms naturally seek outside sources of the data they require. Revere was glad to cooperate in this instance, because it produces large quantities of copper anodes for plating, and has both the equipment and the experience to make thorough tests of electro-deposited copper sheets or layers.

* * *

The Revere Research Department operates a laboratory that contains the latest scientific equipment, including the spectrograph and X-ray diffraction apparatus. If you feel the need of laboratory work on copper and its alloys, or aluminum alloys, please get in touch with the nearest Revere Sales Office.

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801
230 Park Avenue, New York 17, N. Y.

* * *

Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.— Sales Offices in Principal Cities, Distributors Everywhere.

SEE REVERE'S "MEET THE PRESS" ON NBC TELEVISION EVERY SUNDAY

Hankison Gravity-Type Liquid-Feeding Device

Liquifeeder, gravity-type liquid feeder, maintains constant rate of feed and is adjusted by valve that meters air admitted to supply tank. It is claimed that there is no restriction to the flow. The feed can be varied from less than ½ pt a day to more than 500 gal. per day.

Each unit includes a combination sight glass and bubble-type flowmeter. Rate of liquid feed is indicated by the bubble frequency in the sight glass.

Liquifeeders can be constructed of material to suit specific fluids; all parts subject to corrosion are made of stainless steel with Teflon gasketing. Units can be made in any size desired and range from one quart to hundreds of gallons.

Hankison Corp, 117 Biltmore Bldg, 951 Banksville Rd, Pittsburgh 16, Pa

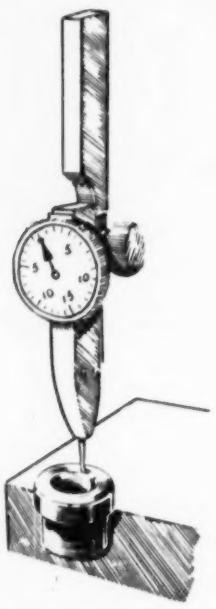
Filter Lubricates Pneumatic Tools With Oil-Laden Air

Air-Speed Williams pneumatic lubricator has fittings adaptable to all standard size airlines. Lubricator has no moving parts but the oil flow can be controlled by needle-point adjustment. Air bypasses the feeder outlet so line does not have to be shut down to refill. Filter section may be cleaned by removing a plug, turning on air, and blowing out accumulation. Unit can be supplied without filter element.

Device features 12-oz neoprene shock-absorber O-ring mountings to permit dragging with the hose without damage. Non-breakable clear-vision window indicates when oil supply is low.

Any good oil up to SAE 30 may be used.

Air-Speed Tool Co, 1502 W Slauson Ave, Los Angeles 47, Calif



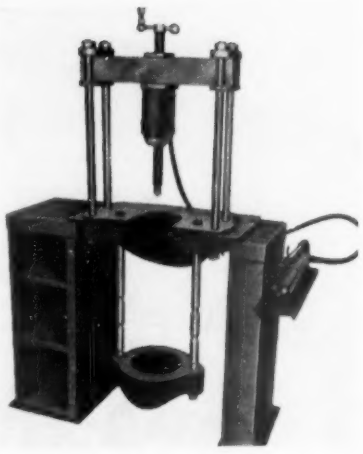
Zero Edge Locator

Zero edge locator was designed to enable jig-borer operator to quickly locate the spindle over the work edge to ten-thousandths. Spindle is centered over work edge by holding the Zero on edge of work by hand with indicator held in the spindle as usual. Indicator is then lowered into center of the Zero and an even reading is obtained by sliding the Zero along work edge and moving table at right angles to the edge.

The Medelton Co, 335 E 142nd St, Bronx 54, NY

TECSOLV No. 383 has been added to Tect's line of safety solvents. Nonflammable, fast-evaporating, and low in toxicity, product may be used with vapor concentrations 10 to 20 times those permissible with carbon tetrachloride.

Tect, Inc, Cortlandt & Erie Sts, Dumont, NJ



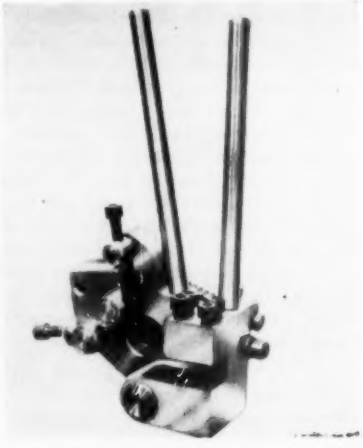
OTC 30-Ton Shop Press Features Open Throat

OTC 30-ton press features an open throat which permits easy entry and removal of work from the press. Center-hole ram with which press is equipped is activated by remote control 10,000-psi pump with 6 ft of high-pressure hose.

Hydraulic ram is said to be quickly detached from press for use with pullers and push-pullers.

Lower press plate can be adjusted to three positions. This feature, together with the screw adjustment through the ram, reportedly facilitates fast positioning to the work.

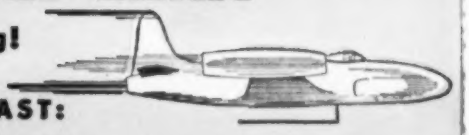
Owatonna Tool Co, 383 Cedar St, Owatonna, Minn



WALKER ROLLER FORMING TOOL, o hand-operated turret lathe attachment, uses standard cutting tool to form hard steels or soft alloys. Work is firmly supported by rollers while cut is being made. Device handles stock sizes from 3/16 to 2 in. in dia — *Mark C Walker & Son Co, Orange, Calif*

today, you're hardly aware of any **SPEED LIMIT** *

on surface broaching!



BUT HERE'S WHAT IT'S BEEN IN THE PAST:

6 fpm 1902

25 fpm 1922

60 fpm 1942

today 300 fpm . . . and more!

* Of course we're talking about the new LAPOINTE ELECTRO-MECHANICAL DRIVE horizontal BROACHING MACHINE

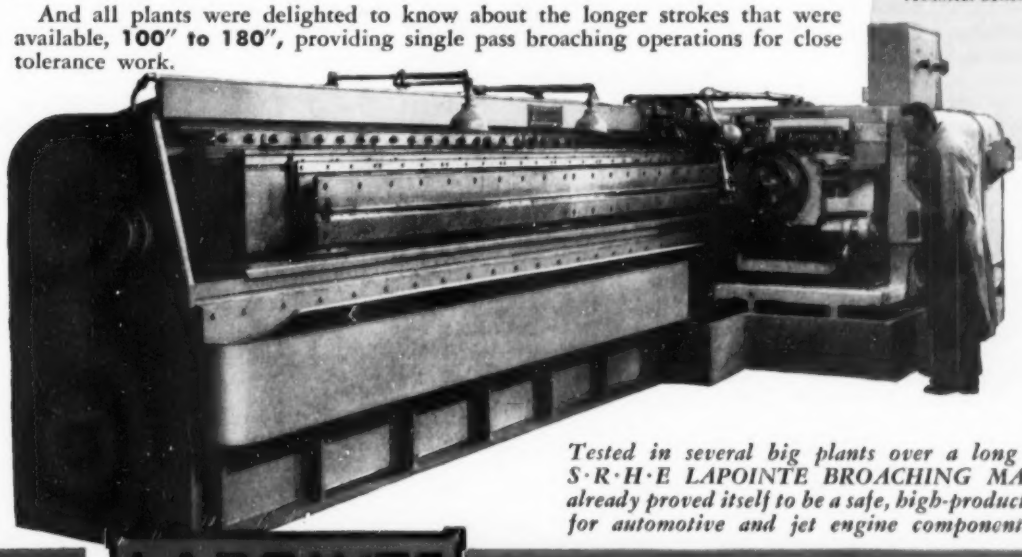
Enthusiastic approval of this new LAPOINTE BROACHING machine has been given by some of the best people — and best plants — in America! How? *They said it with orders!*

These orders came, because some plants wanted the greater flexibility and versatility now available through the Dual Speed and Dual Cycle (patented) features;

Some plants needed the higher production now possible in a modern high-speed broaching machine;

And all plants were delighted to know about the longer strokes that were available, **100" to 180"**, providing single pass broaching operations for close tolerance work.

Write for new Technical Bulletin **SRHE-2**



Tested in several big plants over a long period, the S·R·H·E LAPOINTE BROACHING MACHINE has already proved itself to be a safe, high-production machine for automotive and jet engine components especially.

THE LAPOINTE MACHINE TOOL COMPANY

HUDSON, MASSACHUSETTS • U. S. A.

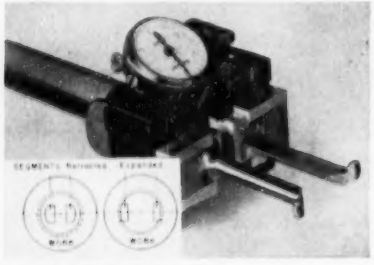
In England: Watford, Hertfordshire

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

Hydraulic Gap Press Has 20-Ton Capacity

Model 220G hydraulic gap press has been developed by Studebaker Machine for jobs that require pressure to 20 tons. The press was designed for speed of operation on jobs such as forming, drawing, bending, forcing, straightening, riveting, upsetting, piercing, crimping, and staking. Frame is heavy welded steel. Hydraulic ram is hardened and ground. Gap is 10 in.; platen size 12x17x2½ in.

Studebaker Machine Co, 1221 S 9th Ave, Maywood, Ill



Portable Groove Gage Checks Dia of Internal Grooves

Portable groove gage for checking diameter and roundness of internal grooves covers a range of groove diameters up to 5 in. and checks grooves which are located to a depth up to 1 or 2 in. from a face, depending on dia of groove.

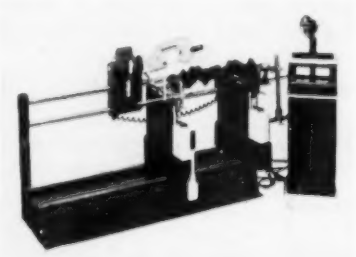
Checking of the groove is done by a pair of segments mounted on platforms, one of which is movable. A thumb lever collapses the movable, spring-loaded lever so gaging members may enter. Release of the lever permits the segment caps to expand into the groove. The movable segment actuates a precision dial indicator which shows variation from basic size. Indication of groove-roundness is obtained by rotating the work, or the gage.

Cast stellite segments are held in place by dovetail clamp which may be loosened to space the segments to the required diameter. Setting may be checked with micrometer, master setting ring, or gage blocks.

Four pairs of groove segments cover standard O-ring grooves from 7/16 to 4⅞ in. in diameter. Another four pairs of segments cover standard snap ring grooves from ¼ to 5¼ in. in dia.

Thickness of segment cap is a few thousandths smaller than minimum width of groove in each dia range, insuring that the cap will enter the groove if the groove is machined within standard tolerance limits.

Bryant Chucking Grinder Co, Springfield, Vt



Stewart Warner Industrial Balancer

Model 704 industrial balancer is a development of the combined efforts of the Stewart Warner Corp and Merrill Engineering Labs. Unit is reportedly set up in less than two minutes. High-speed milling heads, cutters, and grinding wheels may be precision balanced to eliminate marks from vibration.

Precision sensitivity is possible at all weights of items checked or balanced from the range of ½ to 1000 lb. By turning a knob, five dashpot positions allow balancing of different sensitivity from complete damping to 0.04 oz in. Setup to various lengths is accomplished by walking mechanism operated by handle on movable stanchion.

Length range is 4½ to 55 in. between bearing surfaces. Diametral capacity is ½ to 44 in. Price: $3475.

Merrill Engineering Laboratories, 1240 Lincoln, Denver, Colo

Metal Fasteners For Sheets Containing Drilled Holes

Wedgelock metal fasteners, previously used in the aircraft industry for thin sheet metal, are now made in a variety of sizes. Metal or hard-surface parts containing drilled or punched holes can be temporarily held together, and in alignment, under pressure when the combined thickness of material is as much as four inches.

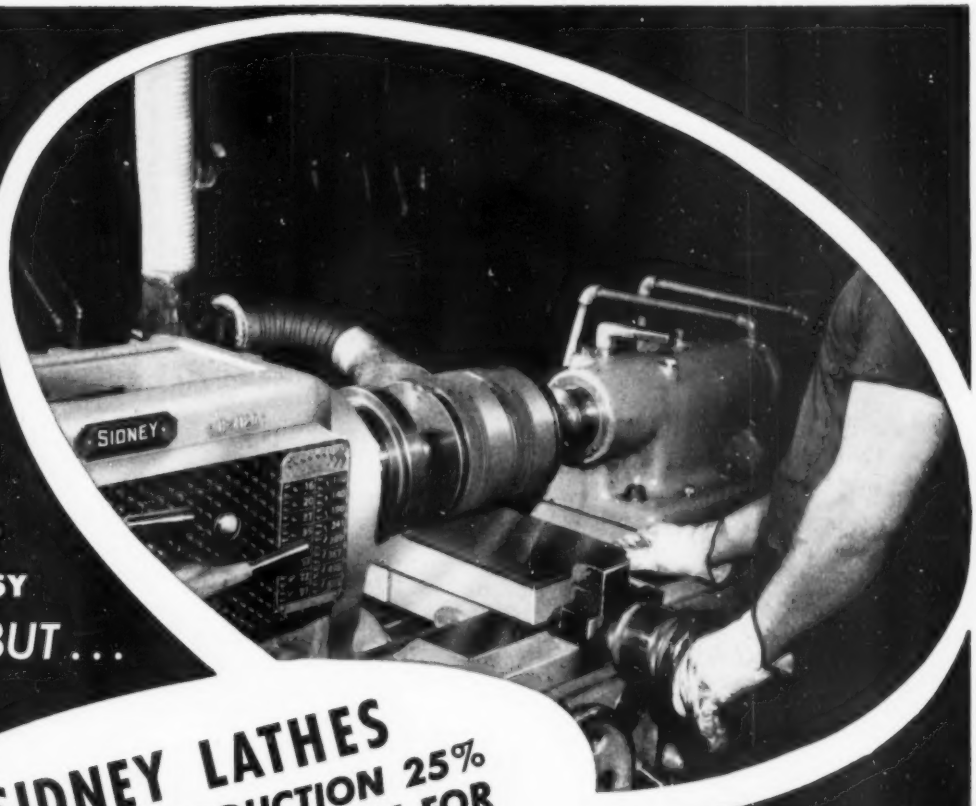
Tools replace bolts and nuts for temporary fastening, hold materials such as templets, jigs, sheet metal, and small fittings in place during drilling, riveting, fabrication, and assembly. They are applied from one side of the work and can be used over and over again.

Fasteners of both spring-actuated and hand-operated wing-nut type are available in a variety of sizes and capacities.

Wedgelock Co, 5446 Satsuma Ave, North Hollywood, Calif

SMALL FLY-CUTTER, imported from Germany, can be used with 3/16-, ¼-, or 5/16-in. toolbit. Unit is made out of one piece with a half-inch shank. Price: $8.50 — *Paul D Rand Co, 11337 Homedale St, Los Angeles 49, Calif*

FORM TURNING PISTON RINGS ISN'T EASY *BUT . . .*



SIDNEY LATHES
INCREASED PRODUCTION 25% AND IMPROVED QUALITY FOR PERFECT CIRCLE

When you consider the millions and millions of piston rings produced by PERFECT CIRCLE you can understand what a 25% increase can mean in the total output. And think also of the infinite precision necessary to achieve the required smoothness on which so much depends.

SIDNEY LATHE'S HERRINGBONE GEARS ELIMINATE TOOTH MARKS

Here's What PERFECT CIRCLE says about SIDNEY LATHES:

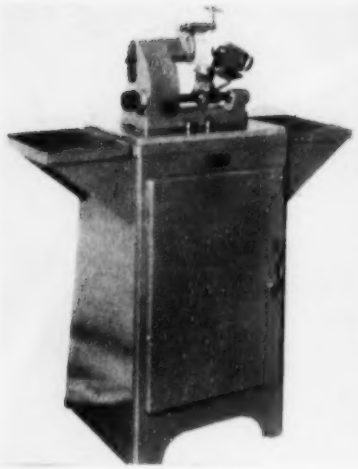
"Your Sidney Lathes were built with special attachments for irregular inner diameter boring and outer diameter contour turning and slitting. *Production of surface feet per minute increased about 25%.* At the same time the quality of the product was improved because of the ability of the Sidney equipment to hold closer tolerances. These factors resulted in increased production per man hour, improved quality and enabled PERFECT CIRCLE to meet delivery dates."

PUT YOUR PROBLEM UP TO SIDNEY . . . WE'LL HELP SOLVE IT.

Write for details or contact nearest Sidney representative

SIDNEY MACHINE TOOL COMPANY • SIDNEY, OHIO

BUILDERS OF PRECISION MACHINERY SINCE 1904



English Cabinet-Type Single-Lip-Cutter Grinder

Deakin & Son, representatives for George H Alexander, Ltd, is now marketing cabinet-type as well as bench-type single-lip-cutter grinders. Machine grinds predetermined angles, radii, and offset radii on HSS, super-HSS, and carbide-tipped cutters. Grinder has universal head, cross-slide, and micrometer adjustments for feeds and chip clearance.

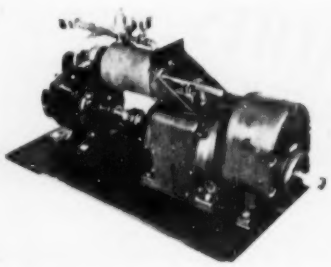
Adjustable grinding arm has graduated tilting support and graduated collar for vertical or horizontal movements of cutters. Each grinder has built-in diamond-dressing device.

J Arthur Deakin & Son, 150-28 Hillside Ave, Jamaica, LI, NY

Interchangeable Parts Lend Versatility to Rolling Mills

Rugged, versatile line of 3- and 4-in. rolling mills, built from interchangeable standard parts, can be modified to roll varied shapes of wires, or flat stock, without major redesign. Units can also be equipped for hot rolling, with water-cooled rollers, or with unhardened rollers for engraving. Rolls are furnished either flat or grooved to produce round, square, half-round, diamond or special shapes to meet individual requirements, and are also available for reducing or compacting small tubing sizes. Especially adaptable to fine-tolerance work, mills maintain parallelism through use of a single handwheel screw, or individually adjustable screws. Wormgear screwdown is available for making fine adjustments while mill is in operation. Rolls are normally supplied in high-finish alloy tool steel. Also available: unhardened rolls that can be engraved to produce patterned surfaces, and special rolls for hot rolling and mirror finishes. Applications: manufacture of small machine parts, jewelry and similar fine-tolerance work; and for testing properties of stainless steel, plastics and titanium. Units can be mounted in various combinations, such as two sets of flat rolls—one for roughing, one for finishing; or one set of flat rolls and one set of wire rolls, etc.

Stanat Manufacturing Co, Long Island City, NY



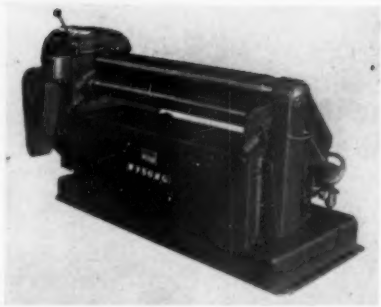
Pneumatic Control For Graham Variable-Speed Transmission

Pneumatic control designed for use with Graham variable-speed transmission automatically gives exact changes in speed to comply with signal from sensing device. Sensing element may be controlled by flow rate, pressure, ph, temperature, humidity, liquid level, or other variables. Since the positioner actuating arm movement is directly proportional to the control pressure and the output speed of the Graham varies directly with the movement of its control lever, the output speed varies linearly, from zero to nearly maximum, with the sensing element signal.

Zero speed is obtained at control pressure of 3 psi and any desired max speed is delivered at 15 psi with ½-speed, 7½ psi at ¼-speed, and so on.

Graham is available with or without built-in motor of any type and with built-in gearboxes if desired.

Graham Transmissions, Inc, Menomonee Falls, Wisc

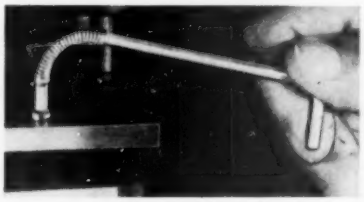


Wysong & Miles All-Steel Rolls

First of complete line of all-steel rolls being introduced by Wysong & Miles includes five sizes of 5-in. rolls of initial or pinch type. Frames are one-piece, all-steel weldments and rolls are accurately machined and polished alloy forgings. Each roll is power-driven and grooved to buyer's specifications. Machine-cut steel gears run in continuous bath of oil and remain in proper mesh at any roll setting.

Top roll drops free for the purpose of lifting and removing formed cylinders. Roll-setting indicator scales are mounted on both end frames. Motor drives flywheel through V-belts and three-way drum control is provided for forward, reverse, or neutral settings. Sizes are 36x3/16 in., 48 in. by 9 gage, 60 in. by 10 gage, 72 in. by 12 gage, and 96 in. by 16 gage.

Wysong & Miles Co, Greensboro, NC



Flexible Wrench For Hexagon Socket-Head Screws

Flexible wrench for hexagon socket-head screws makes it easy to turn screws in hard-to-reach places. Spring connection between members acts as universal joint, enabling operator to work in close quarters. Wrench is not intended for use to loosen the screw from its seat; angled end is used for this as usual.

Set includes five wrenches. Wrenches are made in sizes to fit capscrews from No. 6 to 5/16 in. and setscrews from No. 10 to 7/16 in.

Aetna Mfg Co, Flexsockt Wrench Div, Bensenville, Ill

Drilling Problem?

Black & Decker's Drill Line is a good bet to solve it!

Completeness of Line, Quality Construction Pay Off for Users!

FOR drills to fit your needs—for top performance on any portable drilling job—it pays to check Black & Decker *first!* That's because Black & Decker gives you an unmatched choice of Drill models. Capacities from ¼" to 1¼"—choice of handle arrangement for easiest operation—choice of speed, power and price in most capacities. And it's also because Black & Decker Drills give you powerful B&D-built motors—full ball-bearing construction—extra-tough gears, shafts and chuck spindles—husky housings, streamlined design, perfect balance.

Whether your problem is in production, maintenance or construction—whether it requires large or small drills—see your nearby B&D Distributor *first* for expert help. And write today for free, detailed catalog to: THE BLACK & DECKER MFG. CO., 604 Pennsylvania Ave., Towson 4, Maryland.

B&D Black & Decker TOOLS

WORLD'S LARGEST, MOST COMPLETE LINE

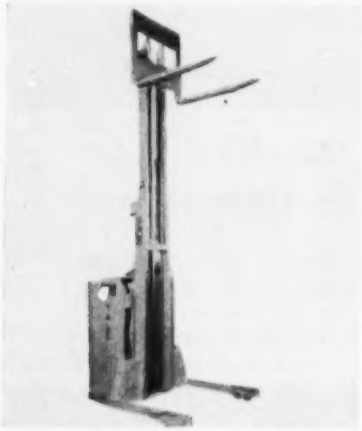
Speed Monitor Acts On Tachometer Principle

Speed monitor head is driven by flexible shaft and gears from any machine shaft, has independently adjustable maximum and minimum speed pointers with the instrument pointer acting as center arm of single-pole double-throw switch.

Thus, in addition to providing accurate and direct indication of speed, the monitor provides a means for controlling speed within maximum and minimum limits, can actuate relays and solenoids to shift gears, operate clutches, signal visually or audibly, control critical temperature of agitated mixtures, control heat in relation to speed on singeing machines, act as an overspeed or overload control, and actuate remote motor-operated valves.

Current across pointer contacts is 3 microamp or less and relay unit will break as high as 350 watts. Unit operates on 115-v, 60-c, ac power.

Jones Motrola Corp, Stamford, Conn



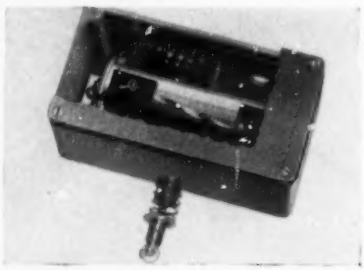
Yale Warehouser Truck Operates In Aisles Less Than 6 ft Wide

Yale Warehouser, an electric rider straddle truck, features more than 200° steer of the drive unit and operates in aisles less than 6 ft wide. Standard models have 2,000- or 3,000-lb capacity. Driver's body is completely inside the truck and hoisting, lowering, and driving are one-hand operations, leaving one hand free for steering at all times.

Features include: Yale-patented fully articulated dual-caster wheel supported on two tapered roller bearings; differential action permitting quick reversal of direction without excessive tire-scuffing; ease of steering through use of spur-gear reduction with drive gear mounted on widely separated tapered roller bearing and large-dia ball bearing steering ring; demountable drive wheel to simplify tire-removal; simple battery-removal from side or top.

Warehouser has three speeds forward and three reverse with time delay controls between speeds for smooth acceleration. No-load travel speed is 4.3 mph; no-load lift speed 35 fpm. Trucks are made up for individual pallet sizes ranging from 30x30 to 48x48 in.

The Yale & Towne Manufacturing Co, Yale Materials Handling Div, Philadelphia, Pa



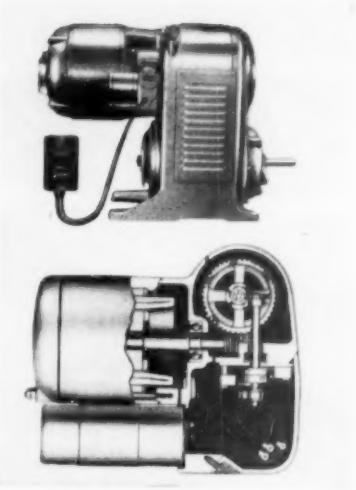
Plunger Potentiometer for Many Electronic Control Applications

Bulletin 68 plunger potentiometers have been designed for industrial electronic control applications such as constant-cutting-speed machine tool drives, winder drives, and processing machinery, as well as numerous dancer roll systems.

Potentiometer interprets position of cutting tool for the electronic control system. When driven by a flat or rotary cam actuated by the cross-feed mechanism, unit may interpret position as a linear or non-linear function, depending on the shape of the cam used.

Vitreous-enameled resistance element and the precious-metal sliding contact are protected by an oil-tight enclosure with external mounting holes. Operating plunger with its roller-type cam follower requires only 12-in. linear movement for complete traverse of the 10,000-ohm unit.

Ward Leonard Electric Co, Mount Vernon, NY

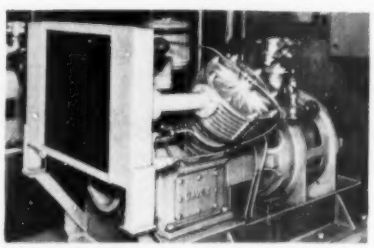


Variable-Speed Motor Operated by Remote Control

US Varidrive motors are now being equipped with ERC totally enclosed remote-control auxiliary motor to provide a positive electrically driven control. It is compactly attached to the Varidrive, replacing the control handle, and is operated by a push-button.

Auxiliary unit is 1/15-hp, 1800-rpm reversible capacitor model with low-inertia rotor for quick stop. Worm drive actuates Varidrive speed-control shaft, as well as the adjustable limit switches; connection box is an integral part of the unit.

US Electrical Motors Inc, Box 2058, Los Angeles, Calif



Stationary Air Compressor Has V-Type Design

Davey 25-hp stationary air compressor, Model 25D, has a displacement of 128 cfm and is available with pushbutton controls, if desired.

Compressor is of V-type with one 7⅜-in. low-pressure cylinder and a 4⅜-in. high-pressure cylinder. Stroke is 4½ in. Standard equipment includes intercooler with safety valve, air cleaners, air pressure regulator and unloaders, motor starter, and controls.

Davey Compressor Co, Kent, Ohio

This new booklet shows you how Kodak Contour Projectors can simplify your inspection and measurement problems

Just off the press is the most informative booklet on Kodak Contour Projectors we've ever published.

- It shows by example and case history how you can inspect large parts, small parts, long parts, curved parts, delicate parts, complex parts, all sorts of parts on the Kodak Contour Projector.
- It gives details of both the Model 2A for precision micrometry, and the Model 3 for fast, routine gaging.
- It describes the features that make Kodak Contour Projectors adaptable to such a wide variety of work.
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Whether your interest lies in toolroom measurement or production assembly and inspection, Kodak Contour Projectors will do the job quickly, completely, and accurately with little training of operators. For complete details, send for your complimentary copy of this new 12-page booklet. Just write to:

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A new sound movie, Optical Gaging, shows how to simplify complex inspection problems. We'll tell you how to get it for a showing.

Kodak

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I CAN'T DRAW GOOD, SO I'M SHOWIN' YOU TH' IDEA I GOT WITH THIS SCRAP PILE STUFF!
WAIT, SEBRING-- WE MISSED SOME OF IT!
WAIT, TALK SLOW-- I WANT TO BE SURE I UNDER-STAND IT!
THEY'LL TRY TO KEEP HIM HOLDIN' THAT UP ALL DAY FOR A JOKE -- LUCKY WE HAVE SOL-SPEEDI-DRI, OR HE'D SLIP BEFORE HE STARTED!
THE CONTINUED STORY
J.R.WILLIAMS

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AM-7-6-53

Arc-welding head shield, called Comfort-Shield, has a permanently pliable headband made of plastic instead of fiber. Band is adjustable to fit both around and over the head, and can be put on with one hand; remains pliable, without drying and curling. One-piece molded fibre shield has wide, deep clearance around head for free air circulation. Normal chin strap has been eliminated. Adjustable stops on each side of headband limit drop of helmet to any point.

The Lincoln Electric Co, Cleveland, Ohio

Solenoid with replaceable coil, changeable in the field by removing two spring clamps, is known as the 2000 size C-T design, available in two models. No. 230 delivers approximately 6.5 in-lb per stroke; No. 231, 9.5; both can be supplied for any voltage rating at 50 to 60 cycles. Dimensions are 2-1/16 x 2 x 0.4750 in. exclusive of mounting flanges.

Dormeyer Industries, 3418 N Milwaukee Ave, Chicago, Ill

Models YC-40 and UC-30 Hyster fork lift trucks are heavy-duty, water-cooled industrial engine models mounted on cushion-type tires. The YC 4000-lb capacity unit has 24-in. load centers, width of 38 in., and overall length of 78-½ in. The UC 3000-lb capacity model has 600 lb less counterweight and 24-in. load centers, over-all length is 74-⅜ in. Both units have sharp turning radius of 75 in., and 30 in. of free lift on standard 9-ft uprights.

Hyster Co, Portland, Oregon

Towmotor Models 480-P and LT-60 pneumatic-tired lift trucks are now available with dual drive wheels as optional equipment, mounted on the drive axle as replacements for standard single wheels. Designed to insure greater stability of trucks equipped with extra-high lifts, installation does not decrease capacities of either model.

Towmotor Corp, 1226 E 152nd St, Cleveland, Ohio

Variety of special vise jaw faces for use with standard machinists' vises include smooth faces of hardened steel to protect soft materials and finished surfaces, and copper non-sparking, non-magnetic faces. Special faces designed to fit irregularly shaped pieces are also available.

Columbian Vise & Manufacturing Co, Cleveland, Ohio

High Precision, Reliability, Top Performance

SCHAERER

MODEL UN-450

Heavy Duty Lathe

SCHAERER MODEL UN-450 HEAVY DUTY COPYING LATHES.

Twin cross slides. Copies from cylindrical or flat template either longitudinally or cross. Twin slides permits rough turning and finish turning in the same operation in many instances. Swings 17-3/4" over bed, 9" over carriage,, 20-5/64" over gap. Center distance 60". Spindle speeds 31.5 to 1400 R.P.M. Hydraulic copying attachment can be removed to permit use as a regular twin slide lathe when necessary. 10 H.P. motor drive to spindle. Separate motors for coolant and hydraulic pump. A production lathe built to tool room standards.

OUTSTANDING FEATURES

Copies simultaneously in 2 directions; 49 longitudinal and cross feeds; All gears in headstock hardened and ground; Automatic carriage release when overloaded; Separate oiling systems for front and rear end bearings; Ball stop catch on cross slide guarantees accurate depth adjustment for thread cutting; Adjustable carriage stop for longitudinal turning.

- *Guaranteed Service by Trained Staff*
- *Engineering Staff will make recommendations based on your requirements*
- *Spare Parts in Stock*
- *Your Operators Trained*
- *Early Deliveries—Some from Stock*
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Many More Machines for Every Operation

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McCASKEY TOOL CONTROL *pays for itself several times a year.....* IN A SMALL SHOP, TOO

The many improvements and savings that result from complete control of tools in the small plant of Lawler Automatic Controls, Inc., Mt. Vernon, N.Y. are described by James Lawler, Jr., Vice-President, in a recent article in IRON AGE.

Manufacture of the Lawler thermostatic control valves requires a wide variety of standard and special tools for their 35 to 40 production employees. Production delays from missing tools formerly were unavoidable and tool expense was high. Here are a few of the results secured with their simple McCaskey Tool Crib Control system, quoted from Mr. Lawler's statements:

- . . . tool crib service is much faster.
- . . . quick location of tools on production floor or in the crib saves an average of two hours a day of a machine operator's time.
- . . . faster crib service saves many hours of machine down-time.
- . . . time required by crib attendant to check tools in and out reduced 70 to 75%.
- . . . tool costs have been reduced from 35 to 50%.
- . . . breakage records make employees more careful about tool use and abuse and provide for quick replacement of damaged tools.
- . . . guesswork has been taken out of ordering and stocking tools through simple and accurate inventory and activity records.
- . . . tool hoarding and loss have been reduced; disputes between crib attendant and machine operators are prevented.
- . . . ***although the system has been in use only a year, it has already paid for itself several times over.***

Let us send you Mr. Lawler's article and complete facts on McCaskey Tool Crib Control showing how you can have similar results in your plant, large or small.

THE McCASKEY REGISTER CO.
ALLIANCE, OHIO

Please send me the article describing use of McCaskey Tool Control by Lawler Automatic Controls, Inc. and complete facts concerning the McCaskey system.

Name .....

Position .....

Company .....

Address .....

AM-7-53

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TOOLS • COSTS • PAYROLL
THE McCASKEY REGISTER CO.
ALLIANCE, OHIO
McCaskey Systems, Ltd., Galt, Canada
The McCaskey Register Co., Watford, England

Enthone Compound NR-31 to prevent rusting of steel, cast iron, and other iron alloys during storage is a mildly alkaline, water-soluble material used in concentration 1 oz per gal. Product removable by water, leaves practically no film on steel. Said to prevent rusting in 100% humidity for several weeks. Available in 100- and 300-lb drums as free-flowing powder.

Enthone, Inc, 442 Elm St, New Haven, Conn

Thompson Anti-Spatter compound to reduce clean-up operations in welding can be brushed, sprayed, or wiped along edges to be welded, and over an area extending 6 to 8 in. from the weld. Hot spatter striking compound can be easily wiped off without grinding or power-driven wire brushes. Two types available: No-Clean SO-327, a foundation for paint, requiring no removal before priming; Pickle-Off SO-317 for pre-pickling or on chromium or stainless.

Thompson & Co, 1085 Allegheny Ave, Oakmont, Pa

Wilshire 3-Way Maintainer, called a complete maintenance machine, is available in two gas-powered models with swaths of 24 and 36 in. Can be quickly converted to suction or blowing; dual clutches permit stopping brush reel while operating air system. Pickup wand enables operator to reach up to shelves; extendable hose permits covering wide area with blowing or suction without moving machine. Pulls in excess of 350 cu ft of air per minute, separating dust from heavier debris.

Wilshire Power Sweeper Co, Glendale, Calif

Two fluorescent portable inspection units are available with or without magnification. Equipped with two- or four-power lens straddled by twin fluorescent lamps rated at 7500 hours life, the Lite-Mite units can be altered quickly for ultra-violet radiation.

Stocker & Yale, Inc, Marblehead, Mass

Adjustable floor plates can be placed directly on the floor without any superstructure and can be leveled with adjusting screws through the top of the plate. Three special wrenches are provided. Can be furnished as single units up to 54 in. wide and 144 in. long; larger plates made up of sections interlocked in one complete assembly.

The Challenge Machinery Co, Grand Haven, Mich

Lightweight, heavy-duty, all-metal electric spray gun operates without a compressor by plugging into ac outlet. Delivers over 90 lb of pressure at 7200 strokes per minute.. Equipped with an 8-ft cord and plug set, 25-oz aluminum container, 5 extra nozzle disks. Price, $17.95.

Waldorf Sales Co, 363 Central Park Ave, Yonkers, NY

Universal Grab has been designed for picking up all kinds of heavy boxes, crates, bales, or other loads where hooks may be used. Heavy forged steel hooks with adjustable spread handle loads from 16 to 48 in. Available in 1000-and 2000-lb capacities.

Palmer-Shile Co, 16019 Fullerton, Detroit, Mich

Magnesium alloy ingot has been designed for the magnesium die casting industry. Alloy, designated Dowmetal AZ91B, contains beryllium additions for lower melt loss and increased efficiency. Price, $0.305 per lb.

Dow Chemical Co, Midland, Mich

Airmatic valve has been improved to permit single control of multi-operations. Enables operation of two or more cylinders in correct sequence without manual handling. High degree of sensitivity allows positive operation at pressure from 20 to 200 psi, air, oil, or water. Available in six standard pipe sizes from ¼ to 1-¼ in.

Airmatic Valve, Inc, 7317 Associate Ave, Cleveland, Ohio

Line of protective lenses for welder's goggles, helmets, and hand shields include green for elimination of glare in aluminum welding, cobalt blue for smelting and furnace work, non-pit cover lenses highly spatter-resistant for use under extreme moist conditions. 50-mm lenses available with straight edges for cup-type goggles, and beveled edges for spectacle models.

Eastern Equipment Co, Willow Grove, Pa

Additional sizes of solid cemented carbide inserts for mechanical toolholders include: a ⅝-in.-dia inscribed circle triangular insert; a 55- and 80-in. diamond-shaped insert; and a ¾-in.-sq insert. These are available in both ground and unground lines.

Carboloy Dept, General Electric Co, Detroit, Mich

PIONEER TALES

No. 1 in a Series of cost-saving case histories

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Now, he makes 1200 a month, and his manufacturing costs are cut in half without adding any men or machines!

Everyone knows the best way to cut costs is through increased productivity. Contrary to the conception of increased production only through more men and machines, Pioneer does it a better way

Take the product mentioned above for example. We made a complete product manufacturing study of the unit. This included tolerance liberalization, interchangeability of parts, functional requirements of parts and overall economy of production.

Our study, coupled with correct functional design and the reprocessing and design of proper tools and gages cut manufacturing costs 50% and increased production 1200%.

And the product manufacturing study cost only $1800!

Write today for Bulletin 162-A which describes our complete engineering services in detail.

Pioneer ENGINEERING & MANUFACTURING CO., INC.

19651 JOHN R STREET, DETROIT 3, MICH.

REID

of matter of preference

It's also a fact that preference is divided between Reid models — some shops and operators give first choice to the power-table type; others prefer the hand-feed models.

It depends on the work, the operator, and sometimes just shop policy.

* Wet grinding attachment (shown with Model 618H) provides a flow of coolant over work. Optional as extra equipment.

† Coal Grinding attachment (shown with Model 618V) provides a fine mist spray at point of grinding wheel contact. Optional as extra equipment.

***All* Reid models include these features for increased efficiency and accuracy.**

- ✓ Finger-tip level hand-wheels lessen fatigue, increase efficiency.
- ✓ Cartridge-type motorized spindle interchangeable within minutes.
- ✓ Rugged one-piece column casting mounted on base insures alignment, eliminates vibration.

Find out why REID is preferred by industry for precision grinding. For a complete description, request Bulletin 618-1.

Reid Brothers PRECISION REID SURFACE GRINDERS **Company, Inc.**

BEVERLY, MASSACHUSETTS

Brulin solvent degreaser, said to be non-toxic and nonflammable, acts and dries quickly and is recommended for production line use. Particularly useful for cleaning electrical motors because it does not adversely affect electrical insulation. Available in drums from 5 to 55 gal.

Brulin & Co, 2939 Columbia Ave, Indianapolis, Ind

Line of open and closed theft-proof steel bench drawers is available to fit any size workbench. Units are equipped with cylinder locks or padlock attachments. Closed tops prevent blocking or lockout through wedging of contents and provide further tamper-proofness at rear. Four standard sizes include: 18x16x5 in.; 18x22x5 in.; 18x22x8 in.; 20x20x6 in.

Industrial Bench & Equipment Manufacturing Co, 97 South St, New Britain, Conn

Keldur vibration-isolation pads for protection against wear on machinery and other equipment are said to reduce noise, and absorb vibration in the operation of highly sensitive instruments and delicate process equipment. Loading weight is 6 psi. Claimed to be impervious to effects of cutting oil, gasoline and diesel fuels. Available in sheets 36 in. sq in ¼-, ⅜-, and ½-in. thickness.

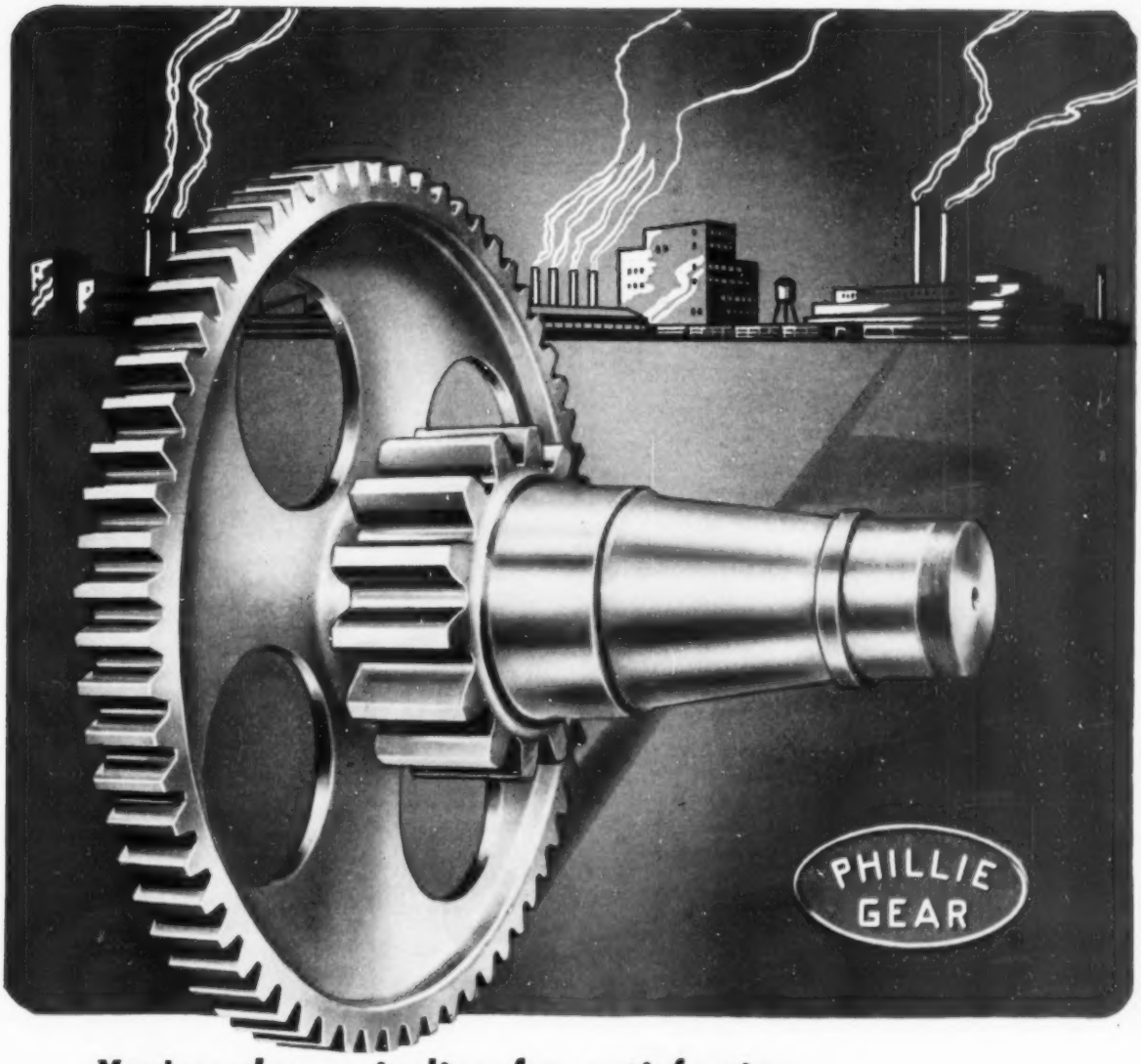
Hobsite Products Co, 308 Sussex St, Harrison, NJ

Line of plastic- and wood-handle screwdrivers has been introduced by Billings & Spencer. Plastic units include: round blade, cabinet type, Phillips point, square blade, stubby and pocket type. New, heavy-duty model, designated Billings wrench grip, is equipped with a hexagonal shoulder providing for application of wrench when increased torque is required. Wood-handled models cover common and cabinet types, extra light, and extended shank. Blade lengths of line range from 1½ to 12 in.

Billings & Spencer Co, Laurel St, Hartford, Conn

Lennan K-2 flashlight, explosion-, water-, vapor-, and damage-proof, has all working parts contained in a sealed-in head which pops in or out of case whenever batteries or bulbs need changing. Equipped with a special cut-in between on-and-off positions for use in signaling, unit operates on a 2-cell torch with a 3-cell flashlight kick.

Lennan Products, Inc, 4407 San Fernando Rd, Glendale, Calif



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For over 60 years Philadelphia has supplied gears of all types, sizes and materials to all lines of industry. Our modern shop is equipped to produce gears to the most exacting specifications while our engineers are willing and able to help you with any special gear problem. For complete satisfaction on every gear order—order Phillie Gear.

Spur	Splines
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Spur Internal	Spiral Bevel
Helical Internal	Zerol
Rack	Hypoid
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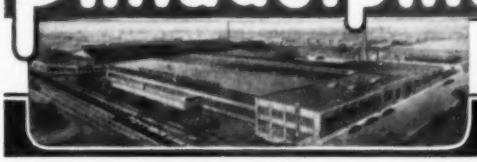
Worm	Sprockets
Non-Metallic	

Philadelphia Gear Works, INC.



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LimiTorque Valve Controls

Loading prefab metal sections at Bargar Metal Fabricating Company, Cleveland.

TOWMOTORS IN ACTION IN U. S. INDUSTRY

Low-Down on the Load-Up

It used to take three men five hours to load one trailer. Now, three men and a TOWMOTOR load FIVE in the time it took for one!

TOWMOTOR has *everything*—TowmoTorque, the new drive that saves shifting time and energy! Creep-Control, so you can ease in and up with loads simultaneously! Exclusive TOWMOTOR Power Steering, to save wear and tear! New "Cushioned Power" Diesels for greater power and economy! When you consider original investment plus cost of operation and maintenance, TOWMOTOR handles more tons per dollar. Write today for book on TowmoTorque and Power Steering. TOWMOTOR CORPORATION, Div. 5607, 1226 E. 152nd Street, Cleveland 10, Ohio.

TOWMOTOR
THE ONE-MAN-GANG ®

FORK LIFT TRUCKS and TRACTORS
SINCE 1919

TOWMOTOR ENGINEERED FOR QUALITY PERFORMANCE

Capacitrol Model 221C, an indicating controller with anticipating action, has been added to the Wheelco 200 Series line. New unit has the anticipating action of the Capaciline added to the electronic link (for fast, accurate control with no contact between measuring and control system) to assure unvarying straight line control. Capaciline, by means of a resistor network and relay circuit, anticipates approach and departure of temperatures caused by various heat transfer lags and load requirements.

Barber-Colman Co, Wheelco Instruments Div, Rockford, Ill

S-X Aluma-Flux compound has been developed for non-corrosive soldering of aluminum alloys (except some containing high percentages of silicon) and the joining of aluminum to other metals. May be used for manual, dip, or mechanical production operations, either in powdered or molten form. Soldered joints are said to produce no corrosive action due to flux residue when exposed to salt spray, high humidity, or alkaline water.

Essex Wire Corp, 3435 Chouteau Ave, St Louis, Mo

Snap-action foot switch for starting and stopping electrically operated equipment has been introduced by Lectromatic Devices. Unit is installed by inserting series plug on footswitch cord into wall receptacle, and plugging apparatus to be operated into the series plug. Switch unit is specially designed to handle high inductive loads with a minimum of arcing; current rating is 15 amp at 115 v. Over-all size is 4¼ in. long, 3 in. wide, 1 in. high.

Lectromatic Devices Corp, 3345 Addison St, Chicago, Ill

Redesigned standard cemented carbide twist drill blanks are available in five sizes, TD-1 through TD-5. Reduced thickness dimensions enable drill manufacturers to strengthen point of each drill, providing more steel backing for each tip.

General Electric Co, Carboloy Dept, Detroit, Mich

LG5 electronic magnetizer charges magnets contained in permanent-magnet motors, phono cartridges, meters, magnetic separators and pulleys. Operates with coils wound to conform to shape of piece to be magnetized; power is 110/120-v, 50/60-c outlet.

Leo Klein-Electronics, 2404 S LaBrea Ave, Los Angeles, Calif

Universal handle for reversible GO-NO GO plain and thread plug gages in cabinet sets is being marketed by Size Control. Each gage member has an aluminum bushing which permits making up multiple combinations of sizes. Eight handles in a set accommodate range of plugs from 0.010- to 0.750-in. dia.

Size Control Co, 2500 W Washington Blvd, Chicago, Ill

Spirally machined Teflon back-up rings, designed to prevent extrusion of O-rings, have high impact strength at temperatures from −100 to +500 F. Non-corrosive, non-adhering, non-fraying, inert to most chemicals, and self-lubricating, they are available for all O-ring sizes of AN drawings 6227 and 6230.

Garlock Packing Co, Dept 34, Palmyra, NY

E6010 electrode, called Airco 78E, for welding mild steel in all positions is designed for deep penetration without undercutting, minimum spatter, and uniform weld deposits without fingernailing. Quick solidification makes it especially adaptable for welding in vertical and overhead positions.

Air Reduction Sales Co, 60 E 42nd St, New York, NY

StaSafe toe clip is a lightweight, detachable steel shell designed to fit over work shoes. Clip can be vise-tightened to desired size, nailed into place over shoe toe. Device is also available with spring and wire mounting for intermittent wear.

Standard Safety Equipment Co, 232 W Ontario St, Chicago, Ill

Varilift adjustable hydraulic system for multiplying lifting speed has been introduced in the new line of Grand industrial hand trucks. A 4-speed adjustment changes lifting rate from 1¼ in. per stroke of hand lever for heavy loads up to 5 in. per stroke for no load. Two other speed positions adjust hydraulic capacity to intermediate load weight requirements. Varilift is interchangeable with all former Grand manually operated hydraulic units.

Allied Manufacturing & Sales Co, 201 N Wells St, Chicago, Ill

La-Co flux has been designed to eliminate surface cleaning before soldering. Product is non-acid, and fluxes through oil, grease, and oxides of metals. Strong capillary action

FASTEST MACHINING STEELS!

You get them all...at Ryerson

Interested in cutting the cost of machined parts? Your nearby Ryerson plant offers quick delivery of the fastest cutting steels on the market.

Carbon steels, alloys, stainless—whichever you need, Ryerson is your best source. Take Ledloy for example. This open hearth steel machines at surface speeds of 300 feet per minute or better, making it the fastest cutting steel available today.

Similar in chemistry to C1213, Ledloy contains a very small amount of lead which acts as a lubricant between steel and cutting tool. As a result users get greater production, longer tool life and a better finish on machined parts. In addition, Ledloy can be case hardened, bent or swedged.

The wide selection of other free-machining steels in Ryerson stock is indicated by the brief list at right. And remember, our steel specialists are always glad to work with you on any machining problem.

So call Ryerson for free-cutting steels and every other steel requirement.

Fast Cutting Steels in Stock

Ledloy—You can't buy a faster machining steel. See why at left.

Rycase—Low carbon, high manganese, open hearth steel with excellent case hardening characteristics. Machinability within 10% of Bessemer screw stock.

C1117—Open hearth high manganese steel widely used for combination of good machinability and carburizing properties.

B1113—If you want Bessemer screw stock, this is one of the fastest available. Machines at 225 SFM.

C1213—The open hearth equivalent of B1113. Machinability slightly better. Cold working properties much better.

B1112—The standard Bessemer screw stock on which machinability ratings of other steels are based.

C1141—Often used instead of C1042 because of high strength, better machinability and greater resistance to wear.

Rytense AA—Improved medium carbon, high manganese steel. Machines at 125 SFM. Good as drawn properties may be heat treated or hardened.

Rycut Alloy Steel—A medium carbon alloy that machines 25 to 50% faster than standard steels of same type.

Free-Machining Stainless — Type 416, a 12% chrome analysis with superior free-machining properties. Also type 303 for better corrosion resistance with excellent machinability.

E-Z Cut Plates—Special high manganese steel with controlled sulphur addition. Cuts cleanly at speeds up to 35% faster than ordinary steel.

PRINCIPAL PRODUCTS: CARBON, ALLOY & STAINLESS STEELS— BARS, STRUCTURALS, PLATES, SHEETS, TUBING, MACHINERY, ETC.

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JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI CLEVELAND • DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

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SPECIFICATIONS

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FORGINGS ENGINEERING
MANUAL. WRITE TODAY

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PORT HURON · MICHIGAN

112

carries sufficient solder in any position, resulting in even distribution, free of pin holes or barren areas.

Lake Chemical Co, 2052 W Carroll Ave, Chicago, Ill

Plastic coating process has been developed for application to flexible steel tubing, metal and paper jacketed tubing, and similar materials difficult to coat. Continuous coating leaves smooth, outer covering, said not to reduce flexibility of the product itself or allow small-opening penetration in item to be covered.

Pyramid Plastics, 554 W Polk St, Chicago, Ill

Gasfoe respirator has been designed to protect wearer against nuisance concentrations of organic vapors and acid gases with obnoxious odors. Formable aluminum facepiece can be hand-shaped to fit; sponge-rubber cushion seals without uncomfortable pressure. All seven parts are independently replaceable, including plastic cartridge containing treated charcoal fill.

Mine Safety Appliances Co, Braddock, Thomas & Meade Sts, Pittsburgh, Pa

Barnaby line of floating holders is now being finished with Du-Lite Black for greater rust-resistance and longer life. Process rounds off microscopic spines and edges; oil-absorptive properties reduce friction, prevent galling and scoring. Finish is said to be chip-, peel-, crack-, and blister-proof.

Barnaby Manufacturing Co, 70 Knowlton St, Bridgeport, Conn

Garlock O-ring seals are designed to provide leakless operation of rotary shafts on centrifugal pumps handling mild, corrosive, or hazardous liquids. Type O is an unbalanced seal for pressures up to 200 psi; Type OB, a balanced seal for up to and over 1000 psi. Both are available with single or multiple spring, in either pin-drive or sleeve-drive construction, in Teflon, buna-N, neoprene, or silicone.

Garlock Packing Co, Palmyra, NY

Jeweled bearing Vipp dial indicator (Swedish) is equipped with universal shank and is graduated in 0.0001; adjustable to all positions. Range is ± 0-40-0; for easier reading, half the dial is red.

Distributed by Homestrand, Inc, Larchmont, NY

Tangents by Tange

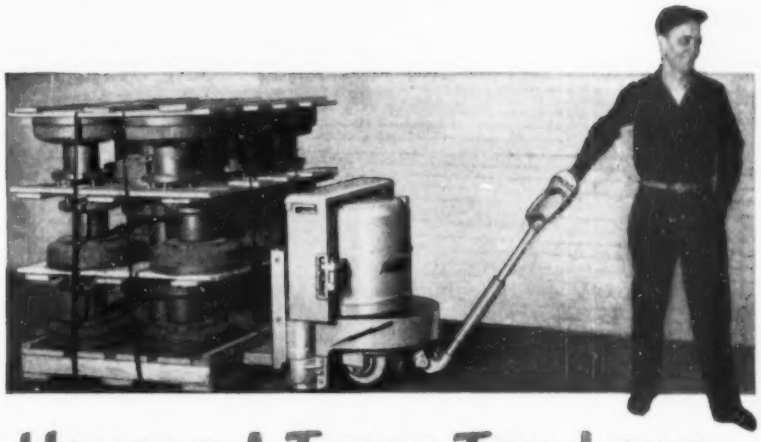
TOUGH GRIND

Alfred University is nestled away in a fold of the hills in far western New York State. It is a little school but it houses the New York State College of Ceramics, the only college rendering a degree in that subject. It now has another distinction. It has just completed a three-week short course in abrasives—the first ever to be given, to our knowledge. The course was open both to students intending to enter this field and to men from the industry. It was a unique course in that students could get college credit from it, yet it was taught entirely by non-academicians. It consisted of a series of 41 lectures by selected men from the abrasive industry, the lecturers having been selected by a committee of the Grinding Wheel Institute and Abrasive Grain Association.

The idea is quite important to our own industry in the sense that it has for the first time provided to students and the younger men an opportunity to hear key men in the field explain their specialties in an informal atmosphere that permits direct questioning. Not only were students shown how abrasive products are made commercially, but also how those products are used in industry generally and in Metalworking particularly.

Lectures covered everything from basic materials, history and geology to manufacture of grain, coated abrasives, bonding materials, wheels —and ultimately their application in industry.

It was my good fortune to be invited to present a look at the abrasive industry from the viewpoint of Metalworking, including statistics from our 1949 Inventory of Metalworking Equipment. I have been particularly impressed for a long time with the rather peculiar situation that grinding wheels are at once the kitchen drudge and lord of the manor, as far as Metalworking is concerned. Roughest and dirtiest jobs—such as cleaning up castings, removing old paint and rust, and cutting off welding flash—are done by



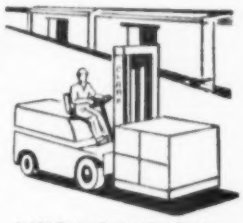
HANDLE A THREE-TON LOAD
With One Hand In Your Pocket...
Use CLARK *POWRWORKERS!*

CAN'T YOU JUST PICTURE THIS MAN trying to pull this load with an old-fashioned manual hand truck! It's a cinch he wouldn't have a smile on his face—there'd be sweat and strain, because those transmission housings weigh pretty near three tons!

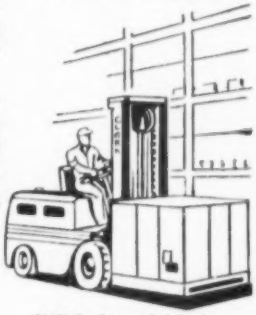
As a matter of fact, his boss is even happier. That POWRWORKER pallet truck has taken the muscle work out of the job, turned a tired worker into the smiling chap you see here. Furthermore, this employee is now doing twice the work he accomplished manually. No labor problem here! And the boss gets more effective use of his storage space, because the compact little POWRWORKER thrives on narrow aisles and low-load floors.

Not to mention the fact that the POWRWORKER is tailor-made for tight budgets. Big-truck benefits at small-truck cost — which means that nobody need deny himself the money-saving advantages of mechanized handling. Pound for pound, dollar for dollar, you can't beat the value in CLARK'S POWRWORKER Line.

Get the facts from your nearby CLARK Dealer (look under "Trucks Industrial", in the Yellow Pages of your phone book) or use the coupon below.

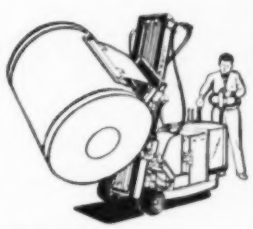


CLARK Electric Powered Fork Trucks. Capacities from 1000 to 7000 lb.



CLARK Gas Powered Fork Trucks. Capacities from 1000 to 15,000 lb.

1903 1953 CLARK EQUIPMENT



CLARK Attachments. 22 basic models

CLARK ELECTRIC, GAS, DIESEL, L.P. GAS FORK TRUCKS
AND POWERED HAND TRUCKS • INDUSTRIAL TOWING TRACTORS

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Please send: ☐ POWRWORKER literature ☐ Have representative call ☐ Material Handling News

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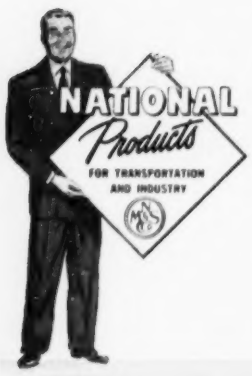
AUTHORIZED CLARK INDUSTRIAL TRUCK PARTS AND SERVICE STATIONS IN STRATEGIC LOCATIONS

Castings by National

selected for Quality and Dependability



Products bearing these familiar trademarks have all established enviable reputations for quality and dependability.

These manufacturers *continue* to procure castings by National—one of the Nation's largest founders.

NORTHWEST · EATON · MW · Kelsey-Hayes · AC ALLIS-CHALMERS · Budd · CATERPILLAR · American-Standard · TIMKEN Detroit AXLES · BALDWIN BLH LIMA-HAMILTON

National's unparalleled experience in producing malleable, heat-treated malleable, and steel castings is at your disposal. Sales offices and engineering facilities are located at all five strategically located plants. A-6346

PLANTS LOCATED IN Sharon, Pa., Cleveland 6, Ohio, Indianapolis 6, Ind., Melrose Park, Ill., and Chicago 50, Ill.

SEE "This Moving World"

A 16mm Technicolor film. Narrated by Edwin C. Hill, this 27-minute film tells how malleable iron is made . . . tested . . . used . . . how its production economy, ductility, machinability, toughness will give you a better finished product. Available for group showings.

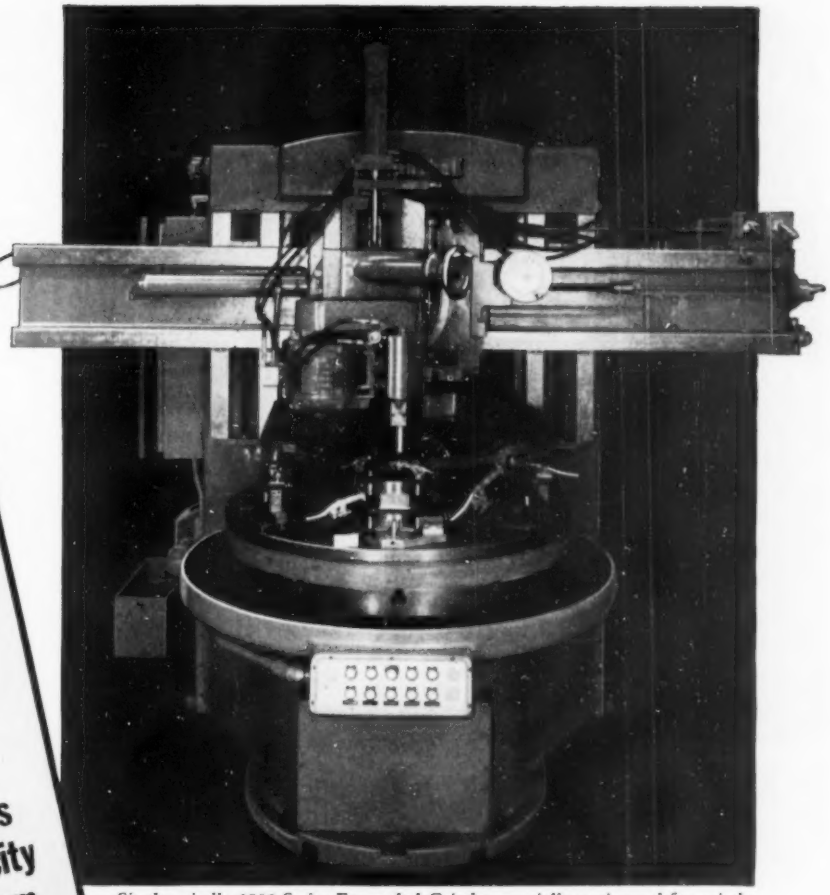
NATIONAL Products FOR TRANSPORTATION AND INDUSTRY

NATIONAL MALLEABLE and STEEL CASTINGS COMPANY
CLEVELAND 6, OHIO Est. 1868

grinding wheels before any other machining. Paradoxically, when the finish must be ultra-smooth or the tolerance ultra-accurate, it is again the grinding wheel that takes over. In addition, it is the grinding wheel that assures sharpness of the tools and smoothness to the ways used in all the other machining processes. This is undoubtedly the reason that grinding machines rank second only to lathes in number of units in the metalworking industry. There were more than 365,000 grinders in our last Inventory—about one-third the tough-job boys like bench, pedestal, and snagging grinders, and almost one-third tool and cutter grinders.

Back in 1905, grinding-wheel sales were 22% of machine-tool sales. In 1935, when machine tools were hard to sell, wheels were still needed, and rose to 100% of the value of machine-tool sales. In 1950, grinding wheels ran about 85% of the value of machine-tool sales. Put another way: If the year 1900 is given n index of 5 for grinding-wheel sales, the peak of the war in 1943 was 350, the end of the war saw declines to about half that. But the story we hear is that if this year keeps on as it started, the 1953 total may be as high as the war peak—in other words, 70 times the use of just 50 years ago. This, to a major extent, is a result of the production of synthetic abrasives and the development of new bonding methods that make it possible to produce reliable, predictable and sturdy wheels. Without them, mass production as we know it today would be impossible.

"Where do they get this 'tolerance—plus or minus, one swipe with fine emery cloth'?"



PRICE TAG? *No!*
PRECISION TAG? *Yes!*
Grinding to less than 200-millionths for concentricity and parallelism

Single spindle 1800 Series Frauenthal Grinder, specially engineered for grinding Diesel engine connecting rods . . . typical of numerous operations where the workpiece is large and cumbersome but hole to be ground is relatively small.

. . . another "MILLIONTHS-of-an-inch" Frauenthal Grinder

IT'S the extreme precision to which Frauenthal Grinders work that surprises metalworking leaders who know the potentials of modern speed-and-precision machines. You will be surprised, too, at the savings in time and money you can make with these super-precision grinders!

In both toolroom and production set-ups, simultaneous grinding of inside or outside and faces . . . or boring and turning . . . can now be held to such close precision of parallelism and concentricity that measurements of tolerance get down to *fractions-of-ten-thousandths*, best expressed in *millionths* of an inch!

Manufacturers of precision parts for aircraft, jet and automotive engines, tanks, gunmounts, radar units, Diesel connecting rods, plug valves, high precision bearings and other industrial and military parts and assemblies find Frauenthal Grinders profitable investments. You are sure of utmost precision, unfailing interchangeability and speedy, dependable production with these "millionths-of-an-inch" grinders.

Series 1800 available in 4 standard sizes, with 30", 36", 42", or 48" tables and 60" maximum swing. Specially engineered features can be included to fit your requirements.

Frauenthal
MULTIPLE-HEAD SUPER-PRECISION CYLINDRICAL **Grinders**
PRECISION-GRIND INSIDE, OUTSIDE AND FACES SIMULTANEOUSLY TO MILLIONTHS OF AN INCH!

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THE KAYDON ENGINEERING CORP.
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ACCO products

WILSON "Rockwell"* Hardness Testers

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I DON'T KNOW

As industry becomes more complex, the average engineer's knowledge must be spread over more and more ground—or he must specialize. Twenty-five years ago, a BSME degree covered (presumably) all there was to know about the fundamentals of both production and powerplants. Now it is admittedly merely a certificate of introduction to those same fundamentals and an invitation to later specialization, either inside or outside college walls.

Actually, specialization is one form of protection, because it releases the specialist from the necessity of knowing about other parts of his general field. Unless his specialty is announced at the outset in every gathering, he may be expected to know such diverse things as the relative Btu contents of garbage and the atom bomb, and how a Stephenson link motion operates.

The effect of this on the non-specialist is to make him attempt to pose as a general expert. He answers any and all questions to protect his professional reputation, may even go on to volunteer information on any and all subjects. The simple phrase, "I don't know," drops out of his vocabulary. It becomes a shameful admission instead of a mark of honesty.

This isn't all the engineer's fault. In the layman's mind, all engineers are alike and are supposed to have all the answers in a broad, poorly defined area of knowledge. The engineer who can't talk learnedly on dams, H bombs, and radar, with interspersed specific advice on how to fix a sagging door or a non-popping toaster, simply loses face. "I don't know" is an admission that raises eyebrows all around.

And yet, "I don't know" is still a very useful phrase. It is essentially truthful, and can save endless embarrassment later. The bluffing engineer who doesn't know—and acts like he did—is no engineer at all. He's a bluffer, and will be caught at it as all bluffers are. And his ultimate loss is greater than it need have been. The whole business is reminiscent of the detailed opinions of American countryside, food, and women which used to be obtained from prominent European visitors before their ships had even docked.

Perhaps that pox has spread to domestic animals, including the engineer. The only antidote we know is good healthy doses of "I don't know," accompanied by an occasional shot of anti-histamine in the form of, "But if you really want to know, I'll find out."—EJT

Operator confidence soars—and so does production—with the Schrader Press Control. For this control is definitely a two-hand device. It is designed so that the hands that feed the die must also operate the press. Both hands must be used simultaneously for each operation of the press and cannot stray into the danger zone when the ram comes down.

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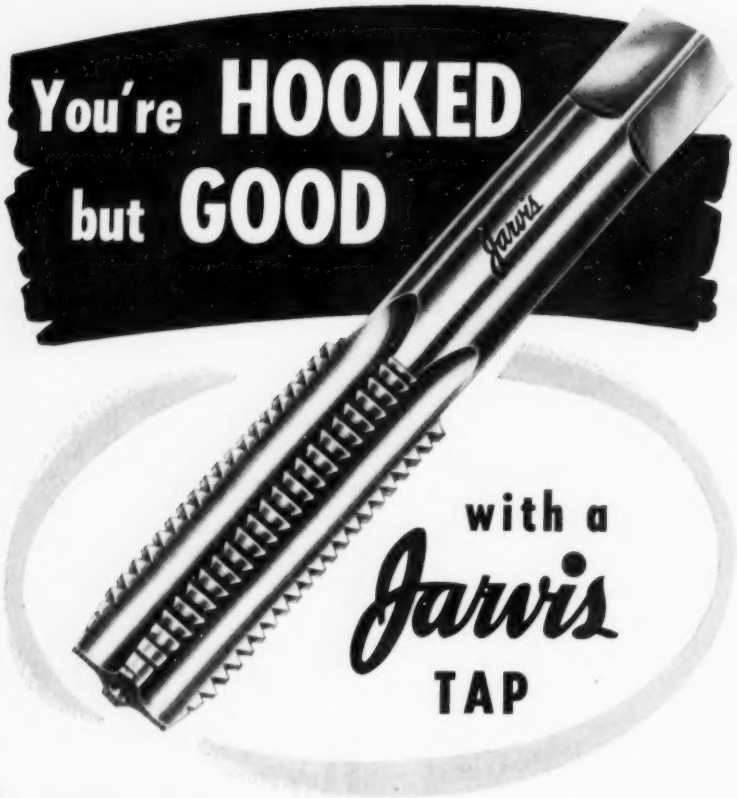

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ROUND TABLE Discussion

PRIVACY, PLEASE

Does working in partitioned enclosures tend to increase efficiency? Will the men resent being stalled off and separated from their fellow-workers? How does semi-privacy affect concentration—favorably or unfavorably?

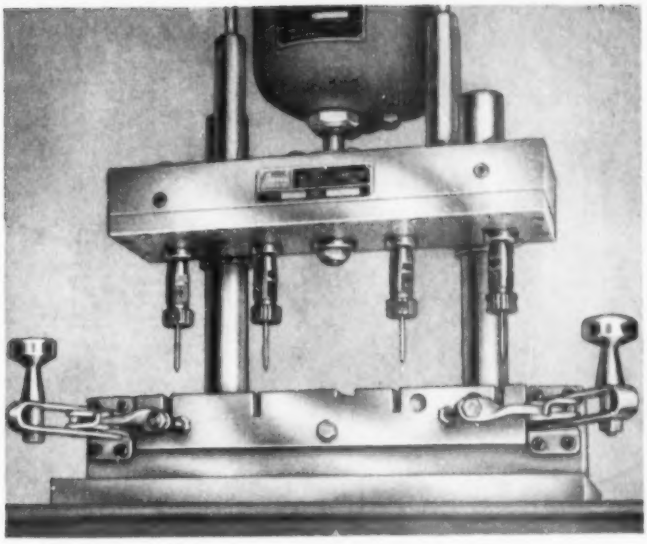
IS THERE A LIMIT to company fixin's around a shop? Indeed there *is* a limit, and it should be strictly enforced with as much vigilance as the rule against drilling holes for fixin's in roof supports and columns carrying overhead cranes.

Concerning fixings which do not endanger the stability of the structure, the limit should be the irreducible minimum. What could be more unsightly, more calculated to harbor dust and dirt than unnecessary partitions, recesses, cupboards, and compartments throughout a workshop? Clear space for the operators to work in, and unrestricted viewing by the executive personnel are indispensable conditions, if good daylight and discipline are to play their part.

Al's breath-taking suggestion of erecting stalls for the hands to work in, amounts to putting the men in blinkers and, in a democracy, only horses and asses are put in blinkers. I cannot think Al is really serious over this matter, and if he is out for sensationalism or notoriety, then he is too late. He must surely know that Moscow thought up the "blinkers for thinkers" idea long ago and, thereafter, extended it to the rankers.

There is another important objection to Al's suggestion. If privacy is considered to be necessary or even desirable for the bench hands, what of the machinists? Would not a little privacy be a desirable thing for them too? What about boxing *them* in, machines and all, so that prying eye—the foreman's for example—might not distract their attention from the job in hand. I take it Al's mind is set on higher production and more efficient organization to free the bench hands from interruption and distraction due, perhaps, to too many visitors and too much talk. If I am right in this assumption, then the discipline and supervision in Al's section leaves something to be desired. A certain amount of chit-chat must be expected in even highly or-

For Multiple Tapping and Drilling . . .



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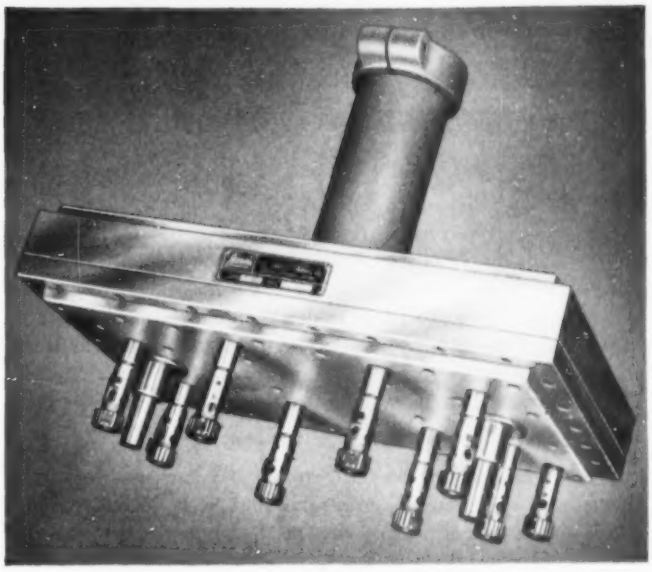

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Rolling with the Punches..

Drum segment assembly, 17½" dia. x 46" long—rough, sandy steel forging. Note the many interrupting cavities on the surface that give the tool its bumps.

On the jump cut job illustrated, a Kennametal clamped-tool is a 6 to 1 favorite over a HSS tool . . . takes thousands of bruising blows on its nose without breaking down; cuts miles of forged, sandy steel without wearing out.

Here are the comparative performances:

HSS tools took 12 hours to complete 2 cuts, and were reground 4 to 8 times. Kennametal tool Style BRH32, Grade K2S, operating at 6 times the speed, does the same work in 2 hours. Its clamped-on tip requires only 2 regrinds.

Great strength and ruggedness are required in a cutting tool, to enable a lathe to keep rolling on interrupted cutting. These qualities, inherent in Kennametal tools, are equally valuable for light, continuous cutting jobs. Ask our Field Engineers to demonstrate. Kennametal Inc., Latrobe, Pa.

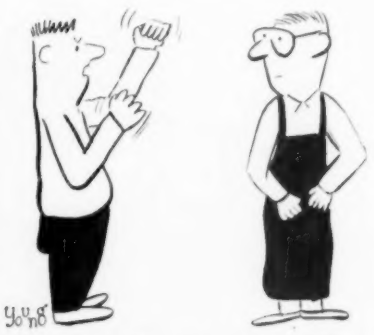
KENNAMETAL
CEMENTED CARBIDE TOOLING
THAT INCREASES PRODUCTIVITY

ganized workshops. I've never seen one where some little wandering around didn't take place, but serious infringements of this nature just don't happen in shops with a live-wire foreman who is always, or nearly always, in evidence on the shop floor.

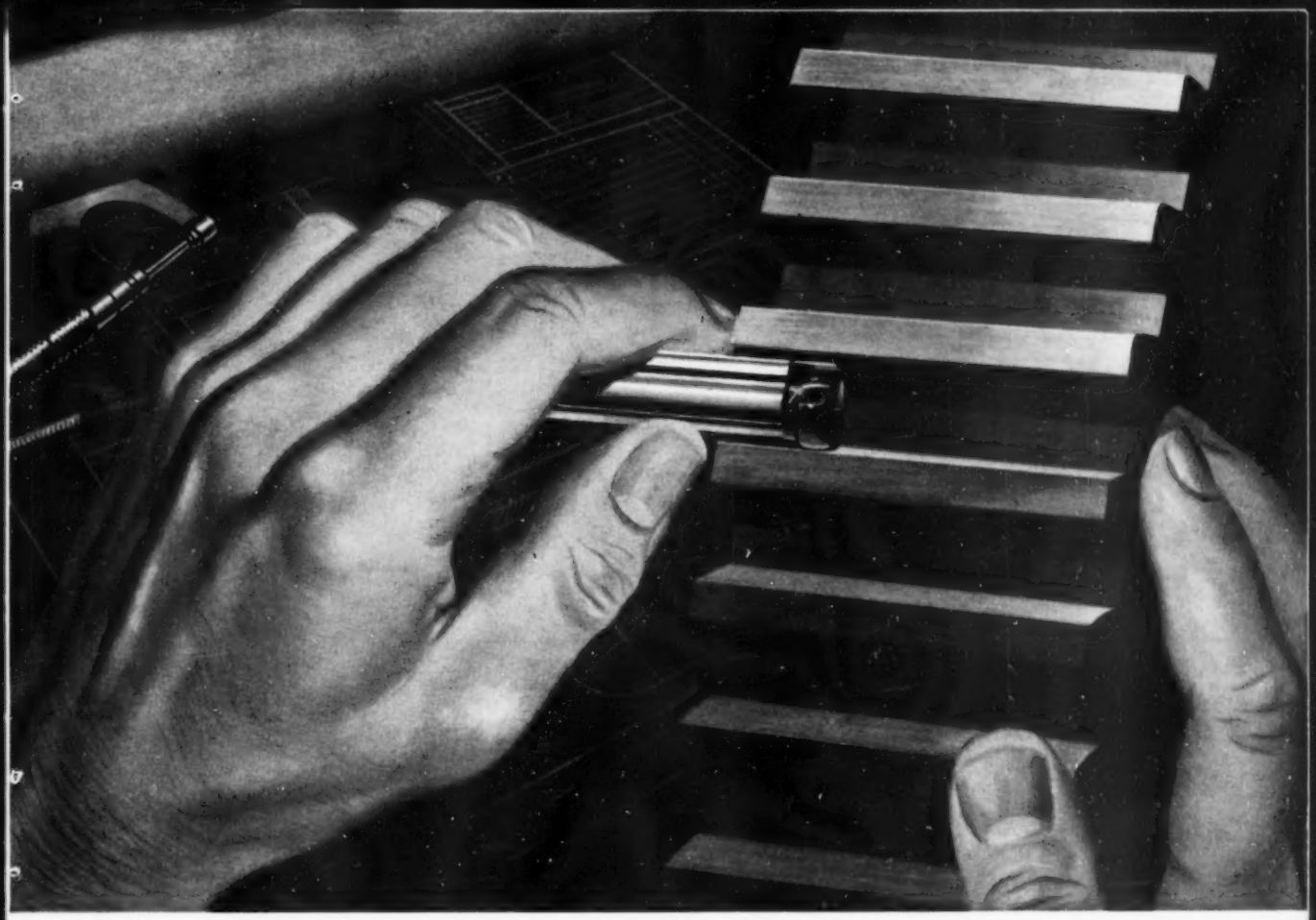
Al's question, "Did you ever hear of anyone objecting to a private office?", is beside the point here. If the bench hands were employed on hush-hush work, complete privacy would be important, even necessary, and would possibly be arranged for by housing the work and the personnel in a separate building.

A foreman is given an office because some of his work is of a private and confidential nature—letters, proposed designs, policy directives, etc. Such papers cannot be left on an open desk in the shops to be pawed over and read by a number of unauthorized persons, to become soiled or to get lost. It is also necessary for a foreman to have a little privacy in which to think over normal or abnormal shop problems, or to receive men who may wish to discuss some private affair with a bearing on their employment. None of those circumstances affects the man at the bench, so that Al's query is, in this case, somewhat pointless.

Eyestrain, to my mind, is probably the most important angle of all. If a bench hand is to be "installed in," his vision will not extend beyond, say, three feet. Such restriction of vision is condemned by the doctors responsible for the general health of the workers, on the grounds that eight hours per day with vision so restricted would, on close work, produce eyestrain and inaccurate vision. Working in an open shop, the man gets the benefit of long vision each time he looks away from the job and even momentary relaxation from close viewing relieves the tension and corrects the strain on the eye muscles. In an enclosed space this relief is, of course, denied him.



"Oh, yeah? Take off your safety glasses and say that!"



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SURFACE ROUGHNESS

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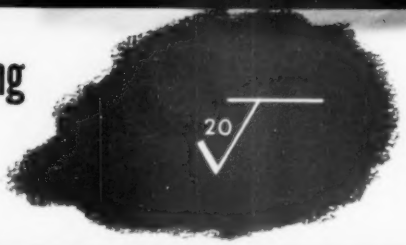
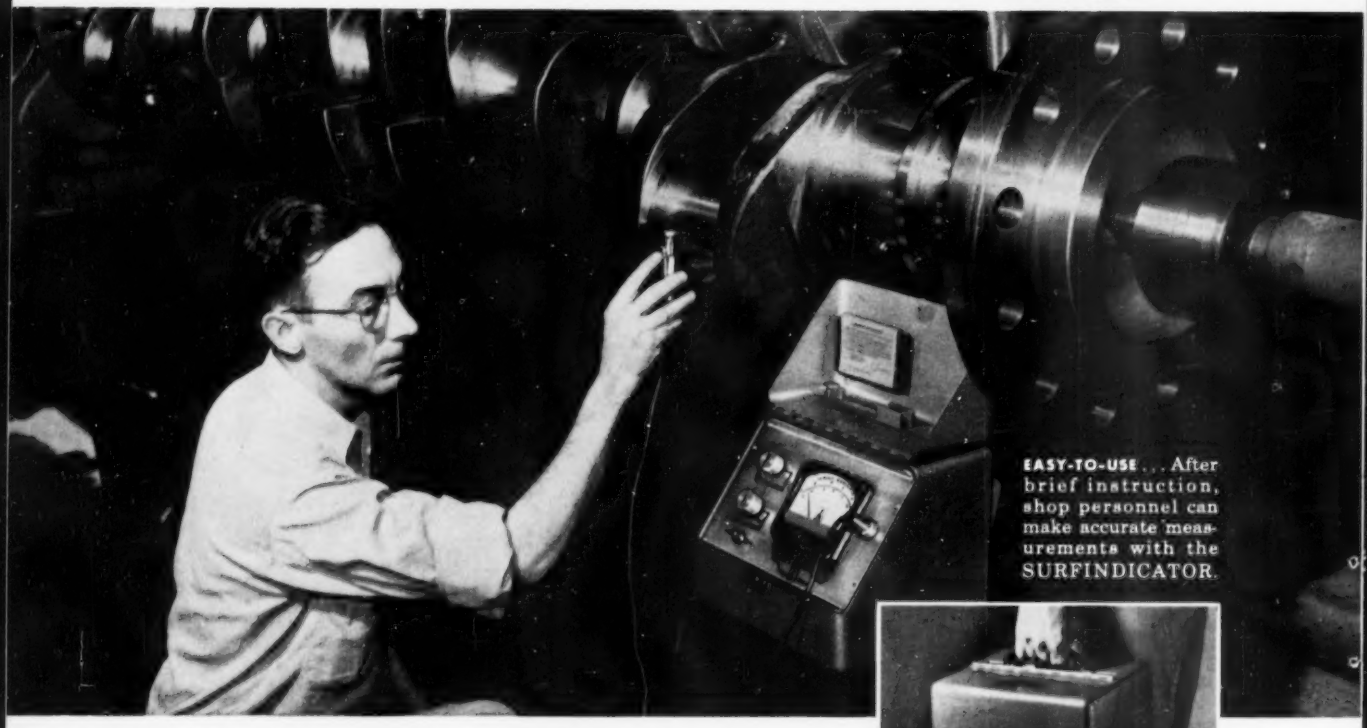
Here is a practical shop tool for measuring

SURFACE ROUGHNESS





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. . . the BRUSH SURFINDICATOR*

With this new, portable inspection tool you can make surface roughness measurements on the production line. The operator merely guides the pickup over the piece to be inspected, and then reads surface roughness in average microinches on the meter. This permits you to specify surface roughness in the design and then to measure it in the shop.

The SURFINDICATOR is always reliable because the unit is equipped with Precision Reference Specimens. These permit checking accuracy of the instrument at any time, and provide a set of standards for absolute calibration. Using SURFINDICATORS, several plants in different locations can produce parts to the same surface roughness specifications. Here is the instrument that makes surface roughness measurement a practical shop operation. Get the complete story on the BRUSH SURFINDICATOR now!

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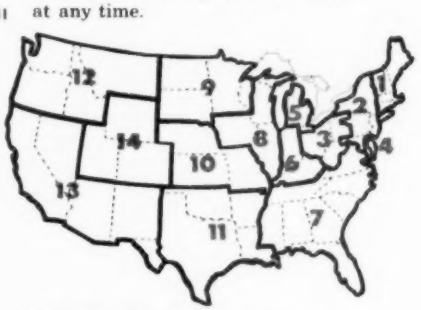

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I am fortunate in numbering among my friends an eye surgeon whose advice I also sought on this matter. He was all against Al's proposal and explained that, in order to focus on a near object, the eye has to do work with contracted inner muscles. These muscles relax when the eye looks into the distance. Glancing momentarily at a distant object rests the eye, and with those short periods of relaxation it is possible to continue close work for much longer periods, without tiring. Constant focusing on near objects is bad; it causes tired eyes and lends itself to inaccurate observation. Eye surgeons, operating in theater or darkroom, restrict themselves to spells of about three hours per session.

Apart from the vision objections, there is the matter of the young tradesman to consider. Working in the open, between two skilled men of long experience, gives the youngster confidence, and if he is alert and interested he will acquire higher knowledge and skill much more rapidly and thoroughly than if he is partitioned off from that valuable source of practical instruction. This off-the-record training is of very real value to the youngster, the production executive, and the company employing them.

Will the men object to changes in working conditions or are those stalls unimportant? In this case, I thought I'd better ask the men. I gave four foremen each a copy of the MACHINIST carrying Al's suggestion and asked them to "call in" a representative selection of the men to read "Privacy Please" and, the next day, to give us the benefit of their opinions on the feasibility of Al's suggestion. At a later stage, I had a chat with several of them. By this time, copies of MACHINIST were making their normal circuit of the

"Invite the boss over for one of your dinners? What are you trying to do, get me fired?"

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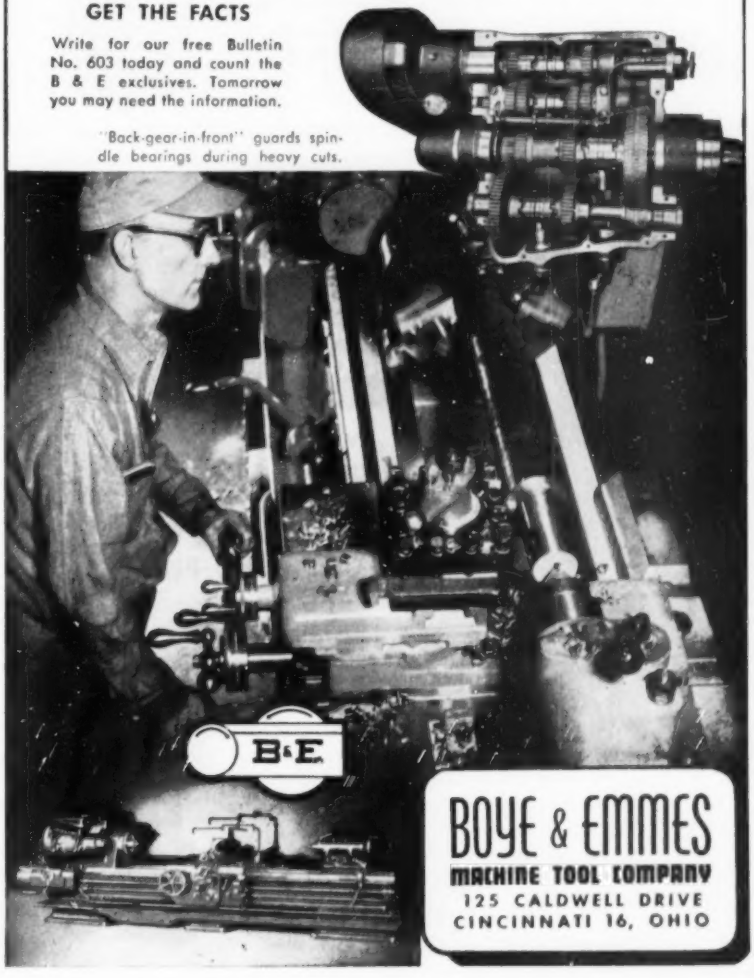

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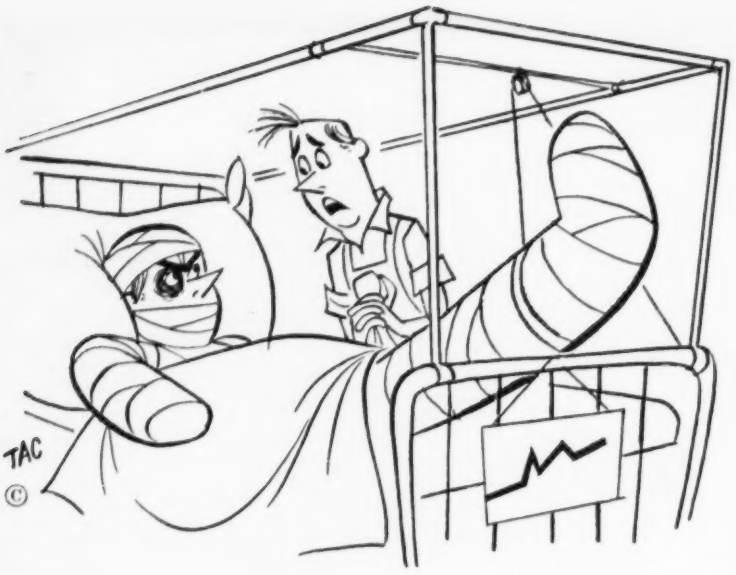

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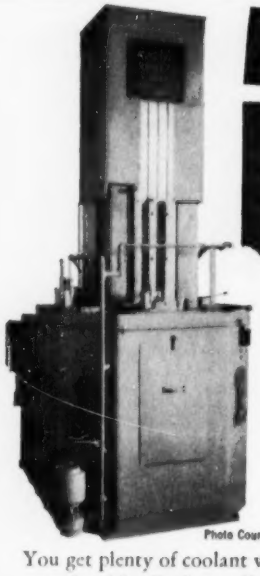

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shops and "Privacy Please" was under fire. No bench hand that I spoke to was in favor and most of them likened the proposed stalls to being in "Barlinnie"—a well-known Glasgow prison—because the individual stalls conveyed to them the idea of solitary confinement. A few expressed the opinion that stalls erected on the benches would destroy the roomy appearance of the shops, would not help the bench hands with their work—they are on payment by results—and would give no return to the company to offset the material and workmanship costs of installing. Each bench hand cleans down his own working space, and the majority thought the brushing down would take longer and be less effective, were partitions introduced. Others, on light, accurate gage work, objected that daylight would be sacrificed to some extent and predicted the possibility of continually working in artificial light, to the detriment of their eyesight. There were many rude suggestons as to uses to which the stalls might be put, but they need not be included here!

To my mind and that of the majority of the men and all the foremen, not only are the stalls unimportant—they are superfluous. There seemed to be no fear of the machinists or erecters feeling jealous or neglected. From what I could gather, their attitude, were stalls decided on, would be one of commiseration for those who might be required to work in them.

M Donald
Lanarkshire, Scotland

•

DOUBLE STANDARD

Will one set of prints, with fixed tolerances, solve the problem of variations in tolerances between engineering, shop, and inspection? Or will allowances continue to be made despite a single standard?

DOUBLE STANDARD means two bases of criteria. If two, why not twenty, on the principle, perhaps, that "you pays your money, and you takes your choice." Foolish, certainly, but is not lack of precision always foolish, and never more so than when production matters are involved?

The writer remembers a plant where drawings were altered in the shops at will by any member of the supervisory staff, sometimes to suit faulty work. The attitude adopted was that the drawing was but a rough guide to indicate what the designer wanted. As could be expected, the components which emerged finally were often different from those

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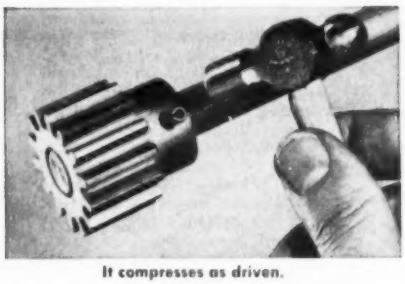
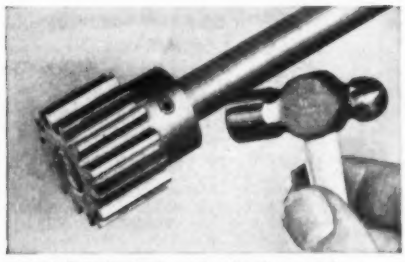


It compresses as driven.



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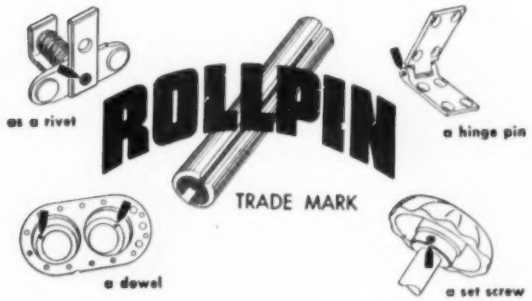

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SIMPLE replacement of heavy cast covers with welded steel units effects an 80% reduction in weight on elevator machine covers at The Shepard Elevator Company, Cincinnati, Ohio. At the same time, manufacturing cost is 50% less. These direct savings result from less material and elimination of machining required on former castings.

Weight reduction is particularly important on this equipment since elevator machines are usually mounted on upper floors of multi-story buildings. Easier handling within the manufacturer's own plant as well as lower shipping charges further add to lowering total costs.

In manufacture, it was originally necessary to mill the bottom edge to form an oil-tight seal. This entire operation is now eliminated. The complete unit is manufactured within the shop and without dependence on outside sources for castings.

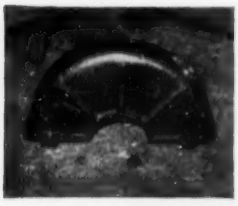

Fig. 1. Original construction of gear case cover weighed 66 pounds and required milling of bottom edge for oil-tight seal with gear case.

Fig. 2. Steel designed gear case cover now used weighs only 10 pounds and costs half as much to produce. Fabricated entirely within manufacturer's own shop by welding.

Fig. 3. Assembly of cover on gear case. Cover is 16 gauge sheet metal welded to plain angles formingoil-tight seal with main gear case.

How to Design in Welded Steel

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CLEVELAND 17, OHIO
THE WORLD'S LARGEST MANUFACTURER OF ARC WELDING EQUIPMENT

the designer had intended or visualized. The absurd practice was at once stopped and the shops taught that drawings must be treated as having the inviolability of the Bible.

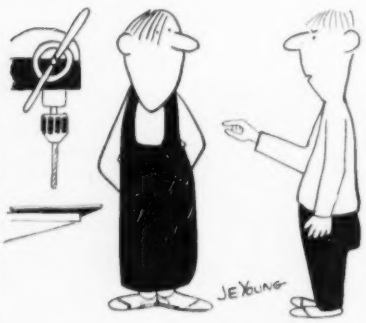
The question of tolerances is surely akin to that of general design, varying only in degree. Tolerances to be embodied in the finished piece are really in the nature of refinements of dimensions for the purpose of insuring that the pieces concerned will be so finished that when assembled in the completed whole they will fit and function as the designer intended. Tolerances are, therefore, entirely a drawing-office responsibility.

Different, however, is the question of allowances mentioned by Al. These are not tolerances, but manufacturing instructions to insure that neither too much nor too little material is left for removal in later operations; these are figurative in character and therefore should not appear on drawings. They are a shop responsibility, even as tolerances are the responsibility of design; the two authorities can, and perhaps ought to consult each other, but they should not overlap.

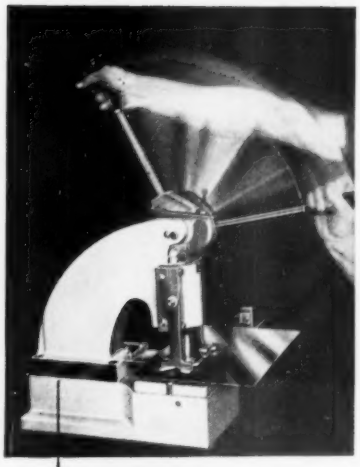
Allowances should be promulgated to the shops by means of schedules of operations. These can be pasted on copies of plant drawings without becoming an integral part of same. Operation specifications have been used in England in this way for 50 years with great advantage, and no difficulty.

P E James
Lincoln, England

DOUBLE STANDARDS are evil, pernicious, misleading things, a poisonous growth of long standing, rapidly spreading in the engineering industry as scientific achievement makes ever-growing demands on our manipulative and operative skill. Those double dealings threaten to engulf



"No, Dimley, I'm afraid a hole about 'this wide' will not be close enough."



PUNCH...
BLANK...
EMBOSS...
FORM...

Quickly, Easily, Accurately with a DI-ACRO* PUNCH PRESS

Deep throats—6 and 12 inches—of Di-Acro Punch Presses make them ideal for many operations impossible to perform on most bench presses.

Holes of various shapes and sizes—as large as 4" in diameter in 16 gauge steel—can be punched. Vee shaped ram controls position of punch head assuring perfect alignment. Turret stripper, of exclusive Di-Acro design, strips material from punches of all shapes. Side and back gauges provide exact work positioning.

*pronounced Die-ack-ro

FOUR HAND AND POWER MODELS AVAILABLE

Di-Acro Power Punch Presses are designed for high speed production. Rated capacity, five tons. 180 strokes per minute. Motor driven flywheel and other moving parts are housed in a welded, steel cabinet.

Hand operated Di-Acro Punch Presses are easy to operate, ideal for short run production and experimental work Rated capacity, four tons.

PUNCH PRESS ACCESSORIES

Complete line of standard size punches in round, square, notcher, rectangular and oval shapes available in six clearances. Also special sizes.

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Tells all about both hand and power operated Di-Acro Punch Presses, Benders, Brakes, Notchers, Rod Parters, Rollers and Shears. Punch and Die Cost Sheet included.

Creators of "Die-Less Duplicating"

O'NEIL-IRWIN MFG. CO.
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Lake City, Minnesota

di-acro PRECISION METALWORKING MACHINES

us in a morass of unreality and make-believe.

Al poses a problem here of first importance to all concerned with design and production. A straight line is described as the shortest distance between two points and when *all* concerned with industry adopt the "straight line" policy, we engineers will travel the distance between the two vital points—conception and execution—in the shortest possible time, a consummation greatly to be desired. If we are to reach our objective with the least possible delay we must face up to facts. Make-believe belongs to childhood and may even be harmlessly employed in selected circumstances in adult life, but in the matter of directives we should make a point of being direct and of facing the facts. The free world is still in danger—and kidding ourselves in the matter of standards can only result in a drop in actual production and won't save our skins any more than the ostrich can save its life by burying its head in the sand.

In planned production, all tolerances should finally be decided in the planning section. This should, of course, be done in consultation with experienced and reliable shop production executives. The planners should give full weight to the views and advice of the production men and if they, the planners, should feel disinclined to stretch a tolerance on a given operation to fit in with available plant facilities, the planners' tolerance should be entered as "provisional," with a view to modification or the purchase of new and wholly suitable plant. Should an investigation trial-run confirm the shop view, the matter would demand further consideration at the hands of the planners. This may involve assembly and service tests, usually of a fairly prolonged nature, during which tests the planners' close limit would be observed by the shops, to allow production to proceed.

In this connection, it should be noted that the shop objection on the grounds of unsuitable available plant need not necessarily mean that the existing plant would be incapable of meeting the planner's close standard. It might mean that it was unsuitable in the interests of high and economical production, that the standard could be met with the existing facilities but only at a price, and by employing operators with the highest degree of skill, and by an unnecessarily high expenditure of machine time. While those disadvantages can be winked at during a period of investigation, it would be

JOHNSON
Universal Bronze

One customer writes: "I always check over the size list of UNIVERSAL BRONZE Bars in the Johnson Catalog before ordering. No use machining away bronze when I can get the right machined diameter from stock. That saves me money two ways—I buy no more metal than I need—and I cut machine set-ups and machine time." Johnson UNIVERSAL BRONZE is completely machine finished inside diameter, outside diameter, and ends. There are 349 different combinations of sizes in cored bars, and 33 sizes of solid bars.

You probably have more applications in your plant for UNIVERSAL BRONZE than you realize. Other manufacturers use it for trolley wheels, sheaves, rollers, guides, spark-proof pinions, special pipe fittings, and air tool tips, as well as for bushings, bearings, thrust plates and washers. Since you can buy it in nearly any size you require, you will save much machining time. Its free-machining properties make further savings. Investigate Johnson UNIVERSAL BRONZE—ask your local Johnson distributor.

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OTHER BEARING TYPES:
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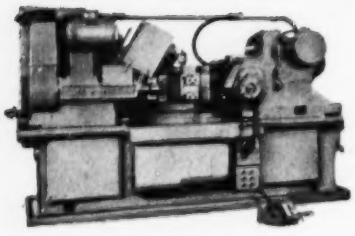
No second operations necessary on the NEW



GOSS and DE LEEUW CHUCKING MACHINE

When any of the various functions for which this machine is designed are performed on it, no further machining is required. The job is finished.

The basic "1-2-3" method—exclusive with Goss & DeLeeuw—provides for gripping work in the chuck and machining all ends either simultaneously or in sequence. By eliminating several handlings and set-ups, the "1-2-3" method produces finished pieces at a fraction of the time and cost ordinarily required.

Send samples of your work for time estimates. Ask for illustrated literature containing detailed information.

GOSS & DeLEEUW

GOSS and DE LEEUW
MACHINE COMPANY, KENSINGTON, CONN., U.S.A.

a thorn in the flesh of the production people, and economically unsound for the company to permanently ignore them.

There is no mystery here; the shop objections and the planners' standard can be impartially examined and the difficulty resolved. The one thing that must not be permitted is that each should go his own way and damn the consequences. To permanently ignore the use of unsuitable facilities and the employment of highly skilled men on what would be a semi-skilled, routine job on a suitable machine would be an unpardonable offence in these days of the scarcity of highly skilled men.

Is the practice of setting tighter tolerances than necessary, as a psychological move, worth its added cost? It may be, so long as we go on kidding ourselves, but it is a needless expense just the same. It has become a bad habit, and like all bad habits its eradication may be temporarily expensive until all concerned are educated to the point of accepting tolerances set as truthful, and until all designers are taught to differentiate between what is critical and what is not. If a given plant turns over to truthful standards, for a time there will be doubting Thomases who will probably produce a fairly high percentage of scrap in the belief that the planners still have something up their sleeves, but they can be converted in time; it dawns on them that the standards set are really truthful standards.

Recently I had occasion to pass an estimated cost for some water-well boring tackle. The driving shaft was encased by means of spider bearings in lengths of tubing, seven inch-

CECIL LOWN

"While I'm on my vacation, Mr Millfield, could my wife here work in my place? We're expecting another one, Sir!"

RADIUS FORMING TOOLS

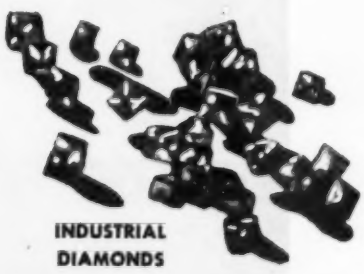
"TRU-LINE" PROFILE DRESSING TOOLS

IMPREGNATED DRESSING TOOLS

STANDARD DRESSING TOOLS

"TRU-THREAD" THREAD DRESSING TOOLS

DIAMOND GRIT TOOLS FOR THREAD DRESSING



INDUSTRIAL DIAMONDS

"Bloomin Idol made o' mud— wot they called the Great Gawd Budd"

—KIPLING

The two French soldiers crouched and watched the white little beam of Indian sunlight creep into the eye of the great gilded image across the shadowy chamber. Suddenly, the eye blazed and flashed with brilliant, jewelled fires.

"Diamantes!" they whispered, and rushed over and clambered up to the great face. A few moments later they ran out into the turmoil and gunfire in the streets and fled with the rest of the French soldiery, retreating before Captain Clive's victorious Sepoys.

A diamond as big as a walnut and weighing 200 carats isn't the easiest thing to trade, but, eventually, it reached an Armenian dealer who sold it to the Russian Count Orloff for $560,000. The Count diplomatically presented it to the Empress Catherine, who was so pleased that she gave him a half-million dollar grant and another title.

After 200 years, the Orloff Diamond is still one of the world's great jewels. Probably it came from the fabled diamond fields of Golconda which supplied ancient Indian craftsmen with diamonds for their metal-working tools.

And, today, as then, diamonds are still the world's greatest cutting element, prized by industry because they so effectively increase production and reduce costs.

For 43 years we have specialized in importing fine industrial diamonds for American industry and manufacturing standard and special diamond tools—engineered to your job and guaranteed to do it. Our field engineers are at your service.

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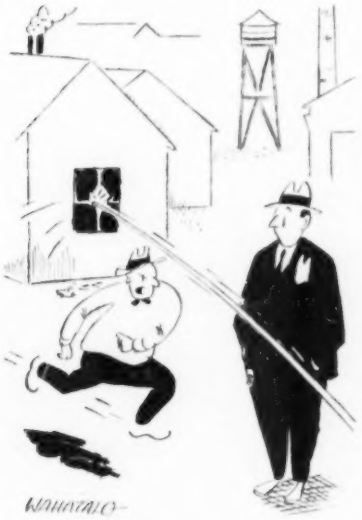
es diameter, the tubes being seven feet long. The specification intimated a tolerance of plus or minus 0.0015 in. on the length of seven feet. Due notice was, of course, taken of this fantastic tolerance when making up the cost, with the result that we were questioned by the prospective customer regarding the high estimated cost. I was invited to call on the firm concerned to discuss, among other things, the matter of price. The managing director was interested when I pointed out the expense involved in holding to plus or minus one and a half thousandth in seven feet of tubing, when their competitors seemed to find sixteen thousandth, up or down, quite satisfactory. The design chief was called in to explain, which he did by protesting that a more generous tolerance might be abused and since there were several tubes in the string, sixteen thousandth added to the length of each would mean a large increase on the total length. I could not see what difference this would make on a boring rig and asked if I might see the layout drawing. When this was produced it was seen that the driving motor connected to the string at ground level was sitting on six inches of concrete, so that one or even two inches would have made little or no difference. In the end, I got a revised tolerance of plus or minus 0.016 in., a new price was offered and accepted and the order was executed to the satisfaction of the customer.

Many mad tolerances are inflicted on the production side under the cloak of keeping up the standard of workmanship. Designers and draftsmen in general should remember that moderation in all things can be the means of saving a lot of money.

This particular form of kidding is, unfortunately, not confined to standards. In the large plant where

"Oh, him? That's the quality-control man hunting one to make his chart look good."

inter-departmental work is not rigorously planned, a habit of long standing is to mark each order form "very urgent." Some time ago I tested the matter by selecting at random a dozen such order forms and phoning the departments concerned to know the latest date on which delivery would be acceptable. Most of the replies were "as soon as possible." I pointed out that I had a large volume of work on hand, much of it overdue through shortage of skilled labor, and that it was necessary for me to make up a program. Under the circumstances I suggested that they state the longest delivery date they could accept and that they should beware of making indefensible delivery demands which might cause other more urgently wanted orders to be set temporarily aside. I asked that this information be in writing so as to be available for future reference in case of possible trouble. The results were illuminating; not one of the twelve "urgently wanted" orders were really urgent, and two were for stock purposes. Most of those concerned were hazy about even the approximate date on which delivery should be effected and had resorted to adopting the easy, lazy way out by marking delivery "very urgent." I am often amused when getting a "red hot" job of the inter-plant type to find discrepancies or omissions on the drawings or, perhaps, to note that gages or templets should, but did not accompany the order. If a given order really is red hot, one would expect that those concerned with placing the work would be sufficiently interested to check over all relevant



"We're experimenting with the continuous-rod casting chief, and we can't shut it off!"

OVER ONE HUNDRED YEARS OF CONTINUOUS SERVICE. ROUNDS, SQUARES, FLATS, HEXAGONS, OCTAGONS

BILLETS AND FORGINGS FOR PRODUCTION, TOOL ROOM AND MAINTENANCE REQUIREMENTS

HY-TEN

"B" No. 3X HEAT-TREATED BARS

This higher-priced alloy steel can save you money!

"B" No. 3X heat-treated bars offer many production economies, even though machined at about ¾ths the speed of annealed bars. They are supplied to your desired physical properties, and can be machined more easily than standard heat-treated bars with equivalent properties. The expense of scaling, distortion, straightening, and often grinding, are eliminated — as well as the cost of extra handling and heat treating of finished parts!

Although the cost is a little more than for ordinary annealed stock, a trial order will convince you of the true economy of HY-TEN "B" No. 3X heat-treated bars! Just call your nearest WL representative.

Write today for your FREE COPY of the Wheelock, Lovejoy Data Book, indicating your title and company identification. It contains complete technical information on grades, applications, physical properties, tests, heat treating, etc.

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information and instructions to insure that no action or inaction on their part could be responsible for delaying the completion and delivery of the urgently wanted work. It is equally surprising to find that when gages, customers' gages, or templets are required, those who are looking for delivery off-the-shelf not infrequently take a week or two to comply. I often speculate on why the red hot job so suddenly seems to cool off, immediately the red hotter is asked to make a contribution. Looks suspiciously like another example of kidding.

M Donald
Lanarkshire, Scotland

•

NOT-SO-SWEET CHARITY

How should fund raising be handled in the shop? Should each individual be assessed a specific amount, or is it fairer to leave it up to the man as to how much he should or can contribute? Who should be responsible for quotas or collections?

"And if you are a slender man,
Not big enough for that,
Or if you cannot make a speech
Because you are a flat,
Go very quietly and drop
A button in the hat."
Oliver Wendell Holmes.

IT IS TRUE that every man who is in the best of health, has a good job, and is a strong man, is a stronger one when he helps to carry the burdens of the man who is ill and without a job. "No man is so tall as when he stoops to lift a little child."

Few men who receive pay-checks, give from a surplus. They give through sacrifice and when sacrifice becomes sweet, we will have to find a new word for it.

To maintain our form of government we must all give, and the man who can find a perfect form of giving to the needs of a community which must be met by the individual and not by the State is wise enough to lead a nation.

The community chest does eliminate a few of the calls made upon the worker and really does cover some of the demands today from our big organizations for health, church and recreation, but as Al says, the man owns his pay-check because he has earned it, and after his family and dependents are cared for, he may use any remaining amount as he sees fit.

There are few men who will refuse to give what they can to help crippled children, the cancer patient, or other splendid private or-

TELL US, MR. CURTIS——

Why did you buy 200 DELTA Drill Presses?

"Three vital advantages built into Delta Drill Presses explain why we use 200 of them," says Charles Curtis, Production V. P. of Copeland Refrigeration Corp., Sidney, Ohio . . .

"**1. PRECISION**—a must. We fight 'tenths' in this business; normally, .002" undersize is scrapped.

"**2. VERSATILITY**—you can mount Delta drill presses upside-down, sideways, gang them in numerous ways.

"**3. LOW INVESTMENT**—numerous permanent set-ups ready for all operations are vastly cheaper than a few that involve set-up time, labor and scrap cost resulting from constant changes of set-ups. We make a variety of plates, heads and parts, and can make a run on one piece simply by taking jigs and fixtures off the shelf.

Direct labor saving of $24,000 a year on one operation

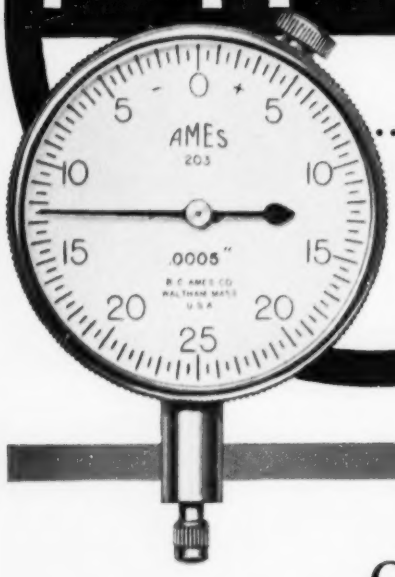
"As for special tools, here's one that out-performs a $16,000 radial drill press. We cut a Delta drill press pedestal in two, put an extension between, mounted the unit on an idle heavy base, fastened a swivel on each half-pedestal, mounting the drill head—and obtained a knee action that does all the radial drill did, only much better. The special Delta rig costing not over $300, operates at 2400 RPM as against 400 RPM; drills more than 200 pieces per day, as against 30-35 pieces; uses 3 men (always ahead of schedule) as against 7 men (always behind)—for a two-shift direct labor saving of $24,000 a year.

Nothing here that a bit of ingenuity and common sense can't duplicate!—with cash benefits that can easily run big. Ask your Delta dealer for the latest Delta Catalog—listed in your Classified Directory under "Tools,"—or write direct to Delta Power Tool Division, Rockwell Manufacturing Company, 618G Lexington Ave., Pittsburgh 8, Pa.

DELTA QUALITY POWER TOOLS

Another Product by **Rockwell**

AMES



...the preferred Dial Indicators

One of America's largest and most famous mass-producers recently chose Ames as preferred source of supply for indicator gauges.

The reasons behind this decision are the very reasons why *you* should standardize on Ames dial indicators and dial gauges:—the Ames "Hundred Series" indicators available in four sizes, fit every measuring requirement; they are *accurate, sensitive,* low in friction, yet are *rugged* and *tough*—give *more* on-the-job time. All Ames products embody latest design and highest-quality materials; they are manufactured by methods and machines that are *exclusive* with B. C. Ames Co.

Ames Dial Depth Gauge No. 11C

Ames Dial Micrometer No. 517

Ames Amplifying Dial Comparator No. 26

Ames Small Hole Gauge No. 36

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ganizations which are working hard to improve the condition of mankind. Surely, most of us have had our personal experiences with loved ones who have had to drop out of the race when they have advanced to a position near the top, because of some misfortune.

To deprive any man from giving of his own free will, will defeat the purpose of any appeal and stifle any tendency of the man to put anything of himself into his gift.

Any system or action whereby the employees of a firm are required to ante up a certain amount each week or each month is not charity nor is it kindness. It is protection in the same way as insurance is protection only some features are different. If a group of men who are employed in a shop or in one department of it make up a purse for one of their number who has been unfortunate—and present it to him—that is charity and, at the same time, it is kindness.

There are a large number of methods of building up a contingent fund which is to be used in case of illness or accident for the benefit of employees of a firm. Some of these have accumulated large sums of money which are expended for certain definite causes.

There are several types of these associations, termed "mutual benefit associations," "illness & accident clubs," and similar causes. Most of them make a collection of dues, either weekly or monthly, and of these they deal out such amounts as may be necessary or as may be decided by a board of control.

There are many who consider the above method the fairest way to do this and many emergency meetings of the directors have been called when an accident has occurred. Some of these associations have clauses in their charters, such as that each member may be assessed certain amounts over and above his or her dues if the treasury

"Just how much do you know of this new traffic manager's background?"

is drained below a specified minimum.

The idea of paying 1% of each member's wage or salary per month is the best from the employees' standpoint, for then each is contributing a small amount from his income and this is seldom felt. Ed's idea that everyone will know the amount another is paying is not necessarily true, for such matters are usually handled in the cost accounting department or the cashier's office.

If a foreman does the collecting, as has been proposed in at least one case, it is safe to say that he would get nearly 100%, for the men would want to stand in with the boss, but as for any collection being made by Al or Ed, no soap. Neither would like it.

As for each man putting in the amount he wishes, or nothing—as Al mentions—it is worse than nothing. It has been tried and has been found wanting.

In a large plant in one of the eastern states one of these mutual benefit associations built up quite a surplus; in fact it was said to be greater than $100,000. The treasurer of the association was one of the company's auditors and often handled large sums of money. One day he phoned in that he was ill and was going to a nearby city to consult a physician. Under an alias, he bought a ticket to a foreign country, returned home and said he would be away for several days; he was never again heard from, but he had about $85,000 with him "and the blow almost killed father."

The best way is for all employees to chip in to their charity an equal amount, then each has the same opportunity for help from his association. Under this method, each can share and share alike.

F H Stebbins
Worcester, NY

ON THE PREMISE that every charitable act is a stepping stone toward heaven, any effort to raise money for a worthy charitable cause is a step in the right direction.

Every year most plants are faced with the annual community charity campaign. The custom in recent years has been to combine all local charity contributions in one drive with each plant being asked to do its share to meet a fair quota. Where the management asks the foremen to meet quotas fixed for each department, it is a proper delegation of authority to get the campaign off to a good start. Most foremen like the idea of one combined charity cam-

Here's Why Last Year More Press Buyers Bought Warco

• Front view WARCO welded steel frame OBI press.

• Front view WARCO cast steel frame OBI press.

• Rear view WARCO welded steel frame OBI press, showing popular WARCO pneumatic friction clutch and brake unit.

O.B.I. Presses Than ever Before

The Warco Open Back Inclinable Press Line is designed and built from the frame out to give maximum performance with minimum maintenance. The slide operates in long hand scraped gibways. The main bearings and crank-pin bearings are provided with heavy walled renewable bronze bushings. The crankshaft is of one piece heat-treated and normalized steel forging. Bearings are drilled and tapped and supplied with either Alemite fittings or piped Alemite system. All Warco O.B.I. Presses are supplied with Warco's popular pneumatic clutch and brake units. Many other quality features go to help Warco O.B.I. Presses constantly gain greater acceptance with leading press users. It will pay you, too, to look over the Warco line before buying new presses.

THE FEDERAL MACHINE & WELDER COMPANY
WARREN, OHIO

Federal WELDERS
Warco PRESSES

Backstand Belts increase production 40%!

Three operations become two— using an Armour Backstand Belt

Sanding, polishing and finishing cast aluminum motor housings were three jobs for a well-known company*, using a hard wheel and two set-up wheels. One Armour backstand belt combined the sanding and polishing operations, increasing production 40%! It outlasted 4 to 5 wheels, and gave a better finish!

Belts are only one of the many forms of Armour coated abrasives. There are more than 30,000 different varieties in form, grit size, backing, etc., to meet your specific requirements. Your industrial distributor will tell you about this complete line. Call him today!

The booklet offered below will save you money in storing coated abrasives. Send for your free copy now.

We recommend buying through your industrial distributor.

*Name of company available on request.

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Please send me the free booklet "How to Store Coated Abrasives."

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A

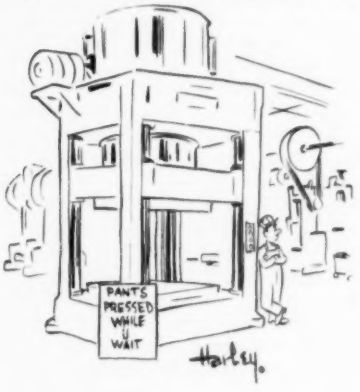
paign in the shops instead of the past practice of an annoying multitude of individual requests.

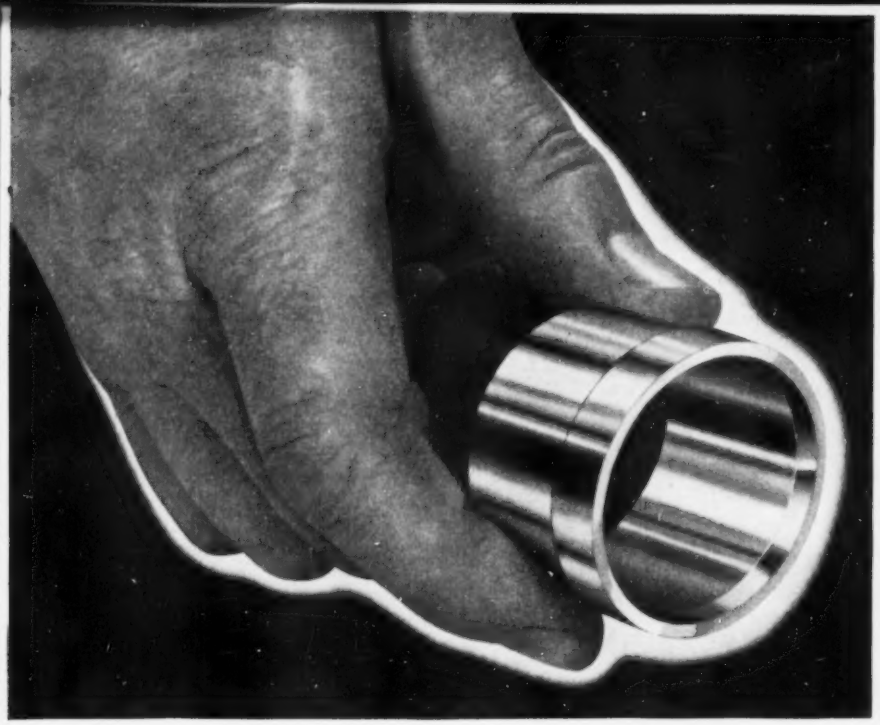
Of course the idea of having fixed quotas for each shop may not sit well with some of the foremen on the premise that contributions are a matter between the workers and their individual consciences. It puts the foreman in the position of a solicitor asking each man for a fixed amount. The foreman will be made to feel that a poor showing in his department will reflect on his relationship with his men. A low return by his department may not sit well with management.

On the other hand, some foremen feel that putting the annual charity campaign in the plant on a competitive basis by departments and shops will stimulate a friendly competitive spirit and increase the amount of contributions. They feel that management is handling the matter in a fair and equitable manner by asking the employees to contribute a minimum of 10% of one week's pay. The foreman's role is one of bringing management's desire to the attention of the workers. The old system of frequent solicitations for a variety of charitable causes with the disruptive and inadequate results in the shop is far inferior to the newer method of fund-raising campaigns conducted on an annual quota basis.

To overcome the objections of making the foreman responsible for meeting charity quotas in his department, the establishment of an all-embracing welfare fund appears to offer the best solution to the "not-so-sweet charity" campaign. The establishment of a properly managed fund that requires periodic crediting of equitable amounts from all workers not only takes care of plant emergencies, such as flower funds and quick assistance to fellow workers during sickness or sorrow, but should also cover charity campaigns.

One such program of which I have knowledge operated by having all



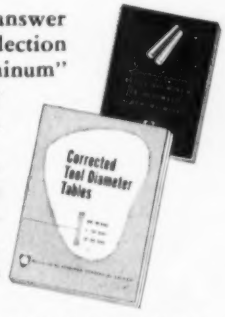


Good coolant practice makes machining aluminum easy

If your tools dull quickly, your work runs hot or chips pile up in the tool zone, check your coolant.

Be sure you are using an adequate volume of coolant consistent with operating conditions. Keep the nozzles open. Direct the coolant stream to hit the work and tools, at the proper angle. Chips should be washed away to prevent fouling the tools. Use a good cutting fluid. Special aluminum coolants generally consist of light mineral oil with 5—10 per cent fatty additions. Viscosity should be 45 to 65 seconds at 100° F on a Saybolt Universal Viscosimeter. Flash point should be above 270° F.

Your local Alcoa sales engineer will gladly answer your questions about coolant practice, alloy selection and machining. You'll find him listed under "Aluminum" in your classified phone book. Aluminum Company of America, 871-G Alcoa Bldg., Pittsburgh 19, Pa.



ALCOA OFFERS TWO BOOKS—*Alcoa Aluminum in Automatic Screw Machines*—a 95-page book containing information on tool design, setup and operating techniques.

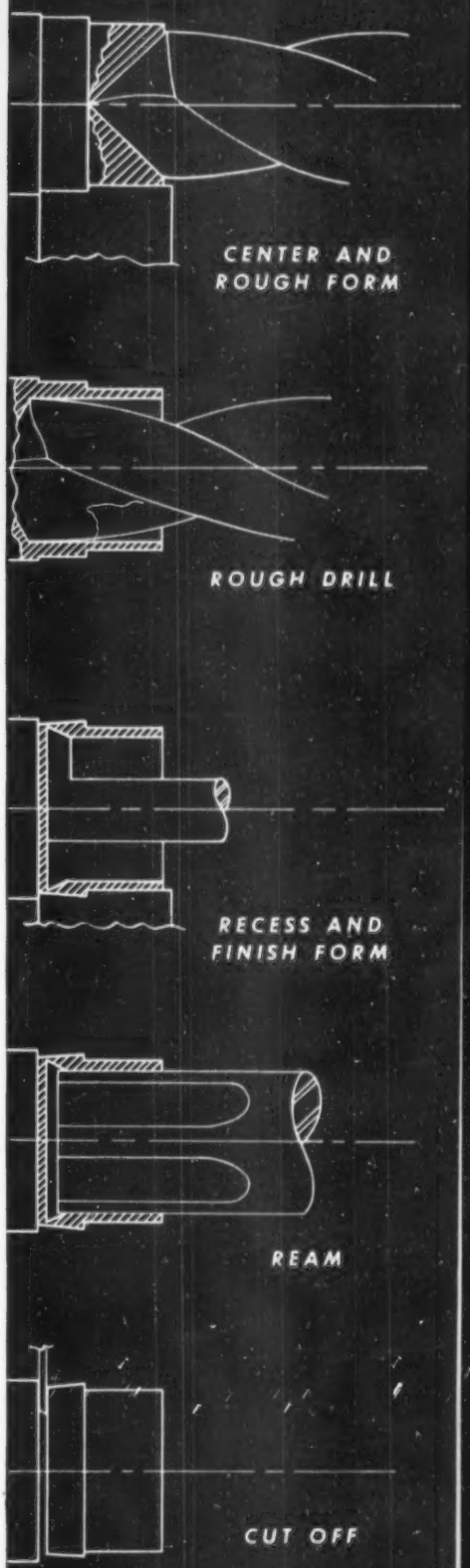
Corrected Tool Diameter Tables—a 64-page book giving corrected tool diameters for circular form tools and flat form tools under conditions of 0°, 5° and 10° top rake.

BASIC ECONOMICS FOR BUYERS

While you buy screw machine stock by the pound, you machine it by the foot. A pound of aluminum gives you three times more feet of stock than a pound of brass or steel.

Alcoa Aluminum

ALUMINUM COMPANY OF AMERICA



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SOFT METAL MELTING FURNACE
Capacity — 1000 lbs. lead

A very efficient and economical furnace for melting lead, tin, zinc, pot metal, type metal, aluminum, etc. No blower required. Nine speedy JOHNSON direct jet bunsen burners deliver pot temperatures up to 1400° F. Assure quick recovery after reloading. Burners are equipped with separate shut-off valves permitting use of only as much gas as required to maintain melting temperatures. Durable construction. Heavily insulated to retain heat and reduce operating costs. Complete with removable cast iron pot and lifting hooks. Available with automatic temperature control at extra cost.

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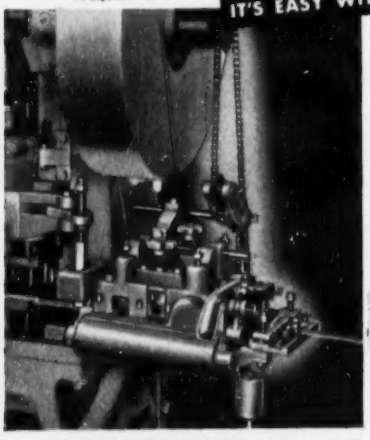


Wittek automatic roll feeds fit all makes and sizes of punch presses—provide maximum efficiency and extreme accuracy in the high speed automatic feeding of strip stock. Made in single roll, double roll, and compound types with straighteners, in models to feed (push or pull) in any direction. Length of feed is easily adjusted to meet individual requirements.

WITTEK Reel Stands

Simplify Handling of Coiled Stock

Choice of standard models to facilitate handling coiled stock . . . from small, light coils to those weighing up to 800 pounds. Larger reel stands automatically center the coils — provide frictional braking action to prevent overrunning, maintain uniform coil slack.

Write for Full Particulars

WITTEK Manufacturing Co.
4320 W. 24th Place, Chicago 23, Illinois

Automatic ROLL FEEDS AND REEL STANDS

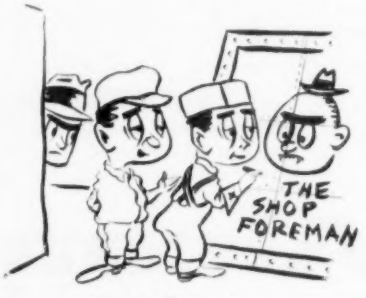
workers pay a representative-collector of the fund a small pre-determined amount every month. Then, when the occasion arose requiring disbursement from the fund, representatives of management and labor previously appointed determined what was fair and necessary to take care of the matter. Where everyone contributed an amount based on a percentage of his weekly wage at fixed periods, nobody had to carry more than his share of the burden. A schedule of fixed amounts paid in and out eliminated the old-fashioned method of meeting the many charity and welfare requests with their inevitable accompaniment of grousing, bad feeling, and unsatisfactory collection.

The prevalent method in some shops of passing the hat whenever an emergency or charitable fund drive is on has earned it a well-deserved unpopularity. The idea that passing the hat constitutes doing something for his fellow man does not rank as high as the fact that another contribution is being demanded. Not that there is anything in a name, but there is much in the different attitudes which these two phrases "welfare fund" and "passing the hat" express.

Of course every right-thinking man admits that the community chest is a fine idea; it should not require paycheck deduction plans to meet a duty to a man's community. The periodic crediting of amounts from all workers based on a fixed percentage of weekly pay will keep the kitty in a healthy state and assure fair share giving for worthy causes.

It has been said that "he who waits to do a great deal of good at once, will never do anything." The welfare fund, built up over a period of time by small, fixed contributions, will in effect enable the worker to spread his good and humanitarian efforts over a longer period in a manner less burdensome to his means.

Harry Kaufman
Philadelphia, Pa.



"—It's still not quite right. He doesn't wear a small hat like that!"

LAMBS OR GOATS?

Will company dinners and similar entertainment tend to bring workers and management into closer understanding, or will the men feel their after-hours are being invaded?

THE IDEA OF HAVING dinner meetings for the hourly workers probably would be a good idea if the company were very small. When thinking of our companies of some 1000 to 10,000 or more employees it certainly presents problems other than strictly financial. What can be gained from such meetings? Does it really solve the problem of getting along with each other?

Both of these questions face top level supervision today. Usually the final decision is that human beings defy change. If a person dislikes another, the mere sitting beside each other at some dinner meeting where a forced truce is necessary will certainly not solve the problem. Ever since the Creation the tendency to like certain persons and dislike others has been a very human trait. The attempts to change this thinking are as old as the world itself. Why is it then that a few individuals think that having dinner meetings will solve all the problems of the personnel relationships? Is it not wishful thinking of those who would like to have an easy life away from the constant employee problem? Wouldn't we all like to have one happy family without the ever-constant ebb and flow of human demands and crises?

The problem can never be solved by company parties for all workers. A Christmas party is perhaps a good gesture, but beyond that it is wasted effort, and many consider it money wasted if all that is desired is to create better friendships among the employees. The comment by Ed that the money could be better spent by putting it in the pay envelopes is well taken—this is the general reaction to a company dinner.

Workers like to feel that they are part of the company, but they know that they have a place. They like to be told things about the company and its operations and they like to receive praise. This cannot be done efficiently at a dinner. Personnel relations must see that proper employee magazines are developed. Sports should be organized for those interested and should be company sponsored and controlled. Suggestion systems and company sponsored safety programs also do much to keep morale high. These things go much further than any number of

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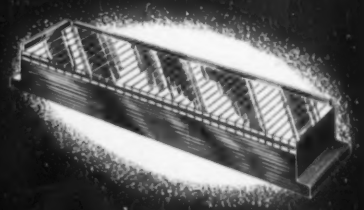
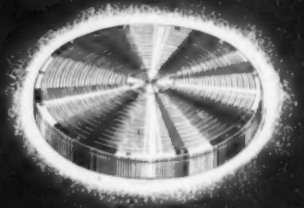


RECTANGULAR... work held to extreme edges of chuck. Sizes to 36" x 96".

ROTARY... inserted ring-type, 6¼" dia. to 48½" dia. Also sectional type for automatic loading, unloading.



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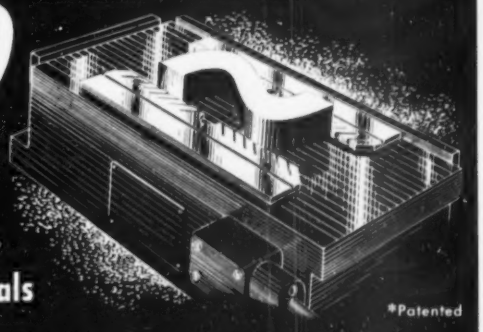

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dinner meetings for the hourly working group.

Dinner meetings for all supervisory personnel can pay off. This however, is a different problem and concerns a much smaller group of people.

Charles D Townsend
West Hartford, Conn

•

AN ANNUAL GET-TOGETHER wherein employer and employees rub elbows at the banquet table has, from my observation many times in the past, promoted good will and harmonious understanding between the so-called opposing factions of an industrial team.

I would like to point out, however, that the employer doesn't always have to foot the bill. I feel that an evening wherein the chief is the honored guest is just as effective in promoting good feelings. By having the factory head foot the bill one time, and the employees another, any feeling of suspicion will be removed.

I do recall an occasion, though, when the plant leader, set up to a swell dinner by the boys, got under their skin very effectively by the injection of a remark as he rose to say a few words. "Whenever I am invited out to eat," he said, "I'm in an expectant mood; I wonder what they're going to put the bee on me for."

You'll always find a character or two who will ask: "Why all this patting on the back? What's he trying to get? All this isn't being done for nothing—we'll pay good and plenty for this feed." Invariably anything handed out on a platter is tainted with suspicion to this type of individual, and even though they attend, their meal doesn't sit very well. They'll go home and still wonder why they're being treated so nicely by the big boss when he could

"He's trying for a running fit."

be more practical by giving them a few extra cents an hour.

An affair of this kind should be well engineered so that there would be no possibility of cliques. Some individual who is well aware of the relations between the workers should be in charge of seating so that the occasion may be effective in healing possible breaches. Better understanding between workers, engendered by bringing them together at the feast of fellowship, tends to increase the efficiency of the whole department.

We think nothing of spending large amounts in winning the good will of the customers; why can't we apply the same idea among the working team within the plant? How are the men going to become better acquainted with their employer unless they are brought together socially? You shut a man up in his private office and, from the employees' viewpoint, he becomes a cold leader who, no matter how he feels toward the workers will be looked upon with distrust by some. Sit that same man down to a table with the men and you'll find a better understanding of each other's needs.

You can't have a successful dinner without speeches, or better still, talks. We Americans have our master of ceremonies to lubricate the bearings of effective progress throughout the gathering; if we did not, the dinner would result in a gastronomical relay in which a few stomachs would become chip-bound.

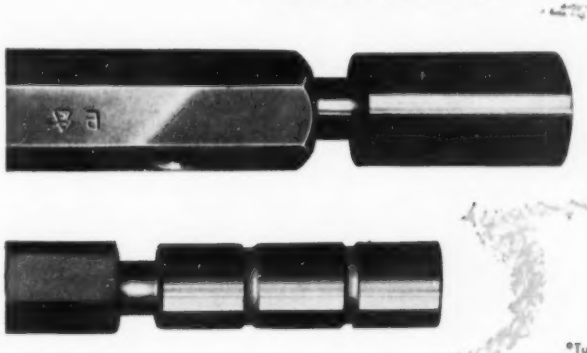
One of these dinner meetings is usually held around Christmas at which bonuses are handed out and various forms of tonsil refreshments are passed around. While I like a little of the joy juice occasionally, I think it is a grave mistake to offend the fastidious by excessive drainage. The warm feeling of camaraderie engendered by stowing away a well balanced meal is ruined entirely by having one or two thoughtless ones spending the balance of the evening beneath the table.

No one can justly reprimand the head of a firm who establishes a policy of maintaining harmonious relations among the members of his working force. No one but a moron will consider an act of kindness and good will as being a selfish scheme to milk the workers by suitable means. If there is the least danger of misinterpretation, let the dinners be bilateral—if such a term can be rightfully applied here—in which the employees participate with equal rank, namely, as hosts.

J Homewood
Ontario, Calif

NOW *Lincoln Park offers*

CARB-O-PLATED* GAGES



*Tungsten Carbide Coated by Linde Process

Carbide wear life at substantially lower cost . . . provided by this new process being applied for the first time by Lincoln Park in the manufacture of gages. Other advantages such as resistance to shock and increased accuracy under varying temperatures add to the outstanding value of Carb-O-Plated Gages for high volume inspection.

Employing the "Linde" flame plating method, Carb-O-Plated Gages are made with a steel base and a thin wear-resistant coating of tungsten carbide. The coating has approximately the same properties as sintered carbide—92% tungsten carbide and 8% cobalt. Some of the principal features of the gages are these:

LONG WEAR LIFE —At least 20 times the wear life of chrome plated gages and equal to that of sintered carbide gages.

MECHANICAL BOND —The mechanical bond between carbide coating and steel base precludes change in properties or warping.

INCREASED ACCURACY —In normal temperatures, these gages undergo identical thermal expansion and contraction as the steel part being gaged. They can be used anywhere without need of temperature-controlled rooms.

SHOCK RESISTANT —Because the carbide is bonded to a steel base, the gages have greater resistance to mechanical shock than sintered carbide gages and are therefore less subject to breakage.

For complete information on this new process as applied to both gages and precision parts, write for our new bulletin.

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New Buy-word for Top Value

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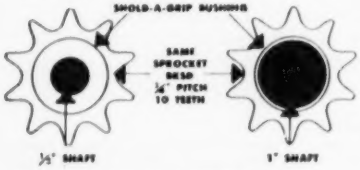
FROM STOCK!

Typical design (above) of SHOLD-A-GRIP Bushing and Sprocket with minimum number of teeth.
Typical design (below) of SHOLD-A-GRIP Bushing and Sprocket with maximum number of teeth.

FIT SHAFTS
½" to 2½" by 16ths

SHOLD-A-GRIP Sprockets of any commonly used pitch, ½" to 1¼", can be interchanged on an extended range of shaft sizes. SHOLD-A-GRIP design adds many smaller sprocket sizes to the interchangeable class.



Example: Sprocket BKSD, ¾" pitch, 10 teeth, can be used on 9 different shaft sizes, any size from ½" to 1" by 16ths, by inserting the correct size SHOLD-A-GRIP Bushing.

Engineered *originally* and *specifically* for Sprocket drives, SHOLD-A-GRIP Bushings are *not* an "adapted" design. Compare . . . see why SHOLD-A-GRIP means top efficiency, lowest maintenance costs.

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-A-GRIP®

Interchangeable Tapered BUSHINGS and SPROCKETS

You'll be Sure to get . . .

Correct Taper

FOR SLIP-PROOF GRIP

In SHOLD-A-GRIP Bushings and Sprockets, you get a taper proved by exhaustive overload tests to be the optimum for slip-proof grip. When screws are tightened the bushing grips both sprocket and shaft with maximum holding power, even on shafts which vary from true diameter.

Correct Taper

FOR EASY REMOVAL

Correct taper saves time and trouble in removal. Cap screws are removed, then two screws are turned into the two threaded holes in bushing flange. Tightening screws releases bushing—quickly, easily.

Matched Tapers

AVOID "ROCKING" FIT

All Bushing and Sprocket tapers are machined with integrated and matched tooling, to avoid possible variation from random production. There is no risk of a "rocking" fit. SHOLD-A-GRIP gives you fast, free interchangeability, over the entire size range.

High-strength Design

BY BOSTON Gear EXPERTS

Because of the unique, patented SHOLD-A-GRIP construction, holes for screws are in the shoulder. There are no weakening holes in the sprocket itself. BOSTON Gear quality throughout assures longer service life on your toughest drives.

Completely engineered and manufactured by BOSTON Gear . . . for 75 years the leading specialists in Stock Gear and Sprocket design.

Complete information on SHOLD-A-GRIP Bushings and Sprockets is available from your Boston *Gear* Distributor, or write Boston Gear Works, 60 Hayward St., Quincy 71, Mass.

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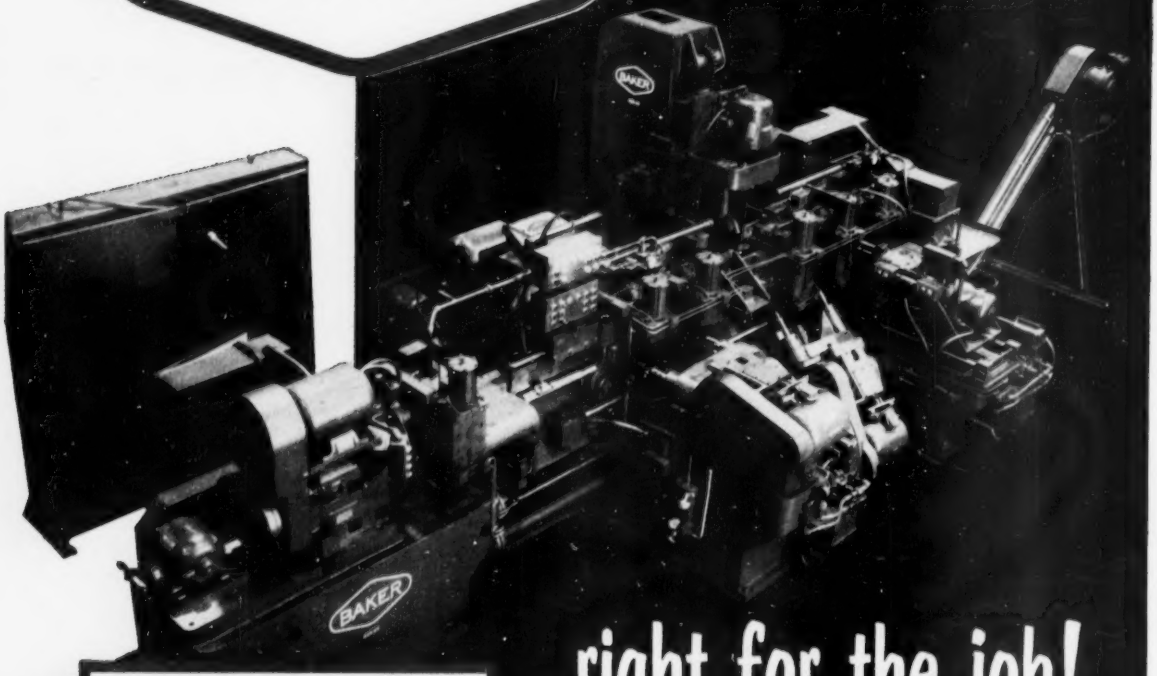
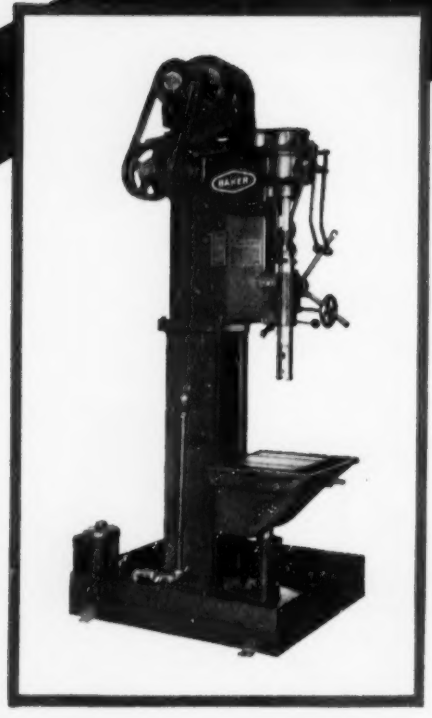
UNIVERSAL JOINTS • COUPLINGS • BALL BEARINGS • OVER 5000 STOCK ITEMS

WHETHER LIGHT or HEAVY..
STANDARD or SPECIAL

BAKER has the drill..



..right for the job!



Regardless of the job requirement, Baker engineers have the know-how to provide drilling machines that will do the job better! Where production figures are of primary importance, Baker will greatly increase productivity . . . and for standard drills over inch and a half capacity . . . there's a Baker *right for every job.* Consult Baker for better drilling machines, no obligation . . . and there is a qualified Baker Sales and Service Representative nearby who is eager to give you prompt and efficient service.

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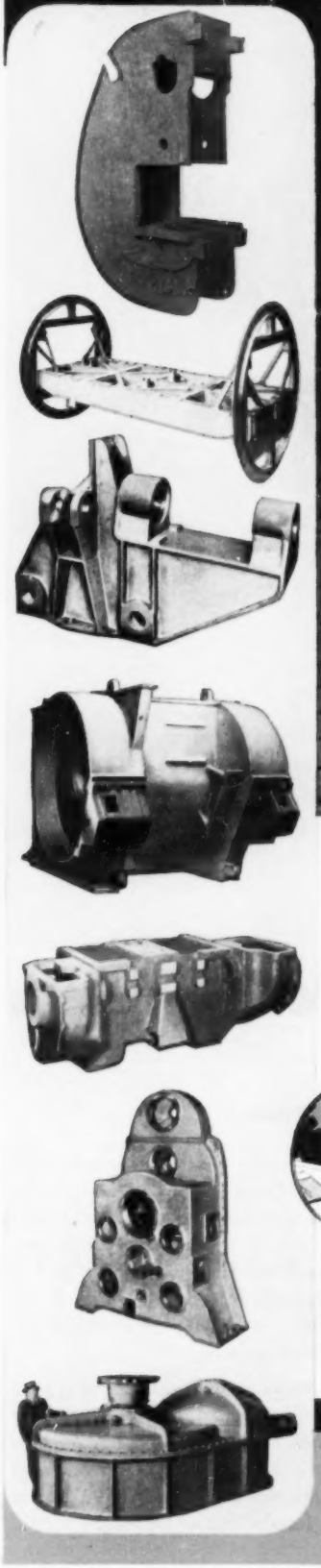
DRILLING...TAPPING...KEYSEATING and CONTOUR GRINDING MACHINES



Use WELDED STEEL for Greater Strength with Less Weight!

Illustrated above is a twenty-two ton Moving Cross-Head for a 2500 ton Press. This and other units illustrated at the left are typical of thousands of Steel-Weld Fabricated parts and assemblies produced and machined by Mahon for hundreds of manufacturers of heavy machines and equipment. If parts of your product could be redesigned and produced to better advantage through Steel-Weld Fabrication, or, if you require a limited number of large heavy pieces, in which pattern costs are a consideration, you can turn to Mahon with complete confidence . . . personnel and facilities are available within the Mahon plant to do the complete job from drawing board to finished machining. You will find in the Mahon organization a unique source with complete ultramodern fabricating, machining and handling facilities to cope with any type of work regardless of size or weight . . . a source where skillful designing and advanced fabricating technique are supplemented by craftsmanship which assures a smoother, finer appearing job embodying every advantage of Steel-Weld Fabrication. See Mahon's Insert in Sweet's Product Design File, or write for further information.

THE R. C. MAHON COMPANY
DETROIT 34, MICHIGAN

Engineers and Fabricators of Steel in Any Form for Any Purpose

MAHON

DRILL OR TAP

all holes at one time regardless of angles with quickly-set-up

MAGNA DRILL

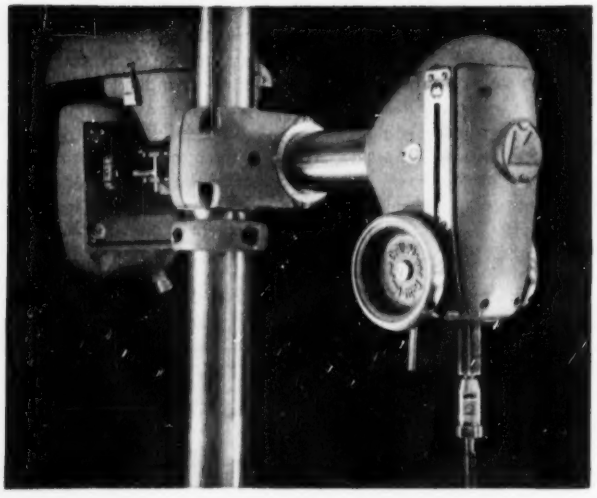
ONLY with MAGNA DRILL can you drill or tap more than one hole in more than one plane at one time—*build the machine around the part in hours instead of days!*

Only with MAGNA DRILL can you feed the drills simultaneously or in sequence by manual or mechanical power—*then remove the quills and substitute lead screw tapping units without knocking down or changing the set-up!*

Only with MAGNA DRILL can you realize all the economies of a custom-built, special-purpose machine at a fraction of the cost—*then change the set-up completely using the same components to do an entirely different drilling or tapping job!*

And only with a demonstration can you realize the full cost-cutting potentials of MAGNA DRILL. See how many ways it can cut costs for you. It takes only a minute to send for the name of your nearest distributor plus complete details and specifications. Why not mark and mail the coupon now?

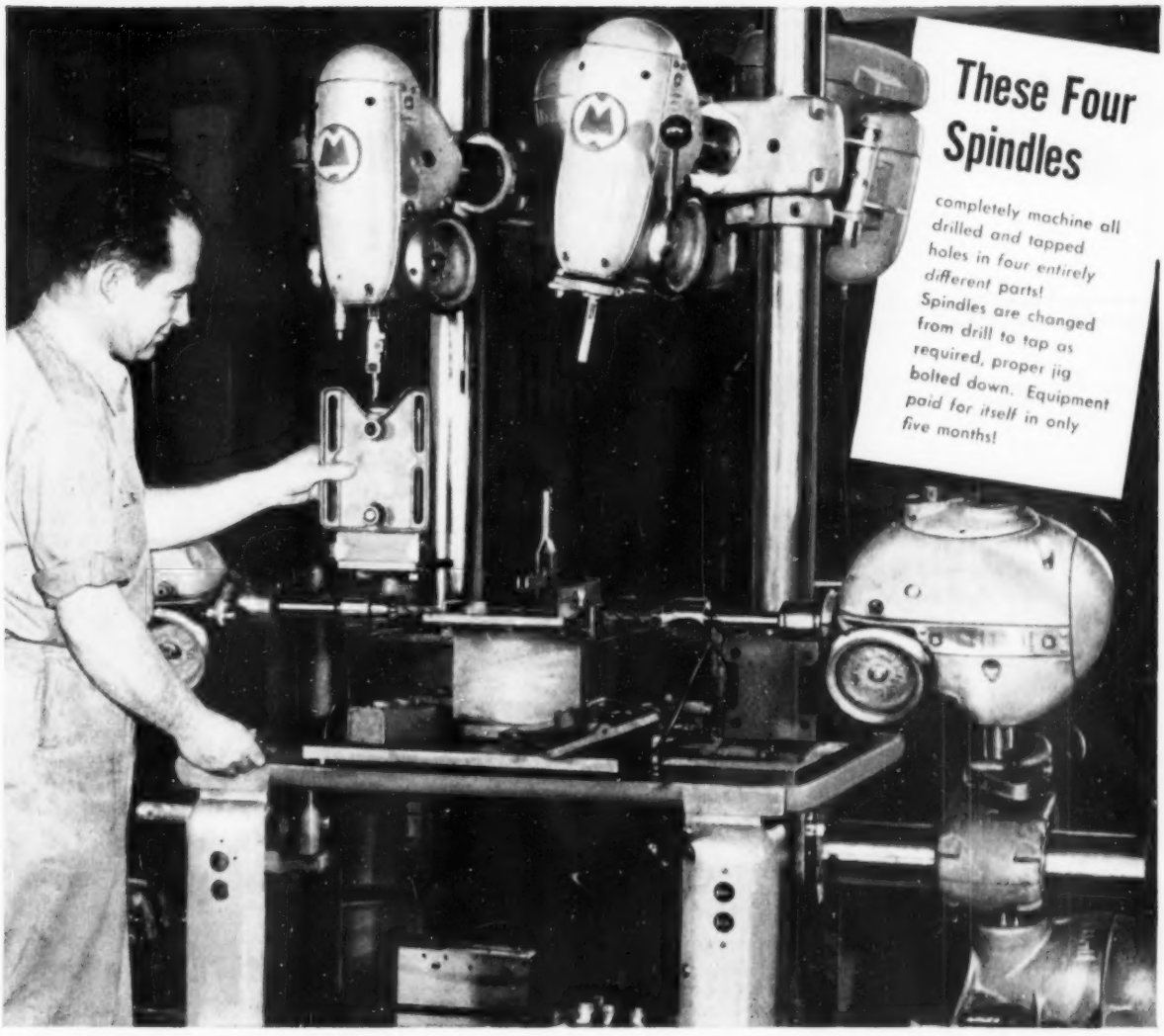
MAGNA DRILL Components



LEAD SCREW TAPPER

Why tap holes one at a time—even if they are at different angles? With MAGNA DRILL you can tap (as well as drill) holes simultaneously using the same basic MAGNA DRILL set-up. Only the spindles need to be changed—a quick, easy job. The special MAGNA DRILL lead screw spindle replaces the quill in the manual feed drill head. No change in set-up or jigging required. No rewiring necessary.

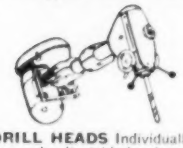
The lead screw tapping unit consists of (1) a reversing starter complete with wiring; (2) the lead screw and bronze nut assembly which replaces the normal quill and (3) a control plate with limit switches which mounts under the front cover. Starter has two-way switch for drilling or tapping.



These Four Spindles

completely machine all drilled and tapped holes in four entirely different parts! Spindles are changed from drill to tap as required, proper jig bolted down. Equipment paid for itself in only five months!

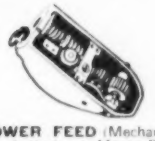
...your keys to complete machine versatility



DRILL HEADS Individually powered, adjustable heads can be indexed and locked at any angle or position **without special tools.** Variable throat. Right or left hand manual feed.

COLUMNS and BASES Tubes supporting drill heads are heavy ⅛" wall, 3½" O.D.; are precision ground. Bases are line-bored cast iron; mount horizontally or vertically.

SPEED-REDUCING QUILL Completely replaces regular quill in a few minutes' time. Reduces RPM by 4.4 to 1, spindle speeds down to 86 RPM with 1725 RPM motor.



POWER FEED (Mechanical Type) attaches to MAGNA DRILL head in a few minutes. Feed rates .003" to .012" per revolution. Solenoid engage. Spring return. Automatic cycling.

TABLES Drilled and tapped for mounting head in variety of positions and for ganging tables in multiples. Single table, 24" x 20". Double table, 24" x 40".

Magna Drill Prices F.O.B. Destination:

DRILL HEAD (less motor)	$265
COLUMN AND BASE	45
TABLE (24" x 20")	170
TABLE (24" x 40")	220
POWER FEED (mechanical type)	175
LEAD SCREW TAPPER	255
ADDITIONAL LEAD SCREW AND NUT	50
SPEED-REDUCING QUILL	150

MAGNA ENGINEERING CORP., Dept. 245-L, at factory nearest you, 12819 Coit Rd., Cleveland 8, Ohio, OR Menlo Park, California

Send me name of nearest dealer and detailed specifications on MAGNA DRILL.

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These 5 Features are exclusive with Bridgeport

...the TURRET MILLING MACHINE that:

1. provides a means of milling, drilling, boring and shaping combined with ability to position the milling head at angles over a wide area . . . *without changing set up.*

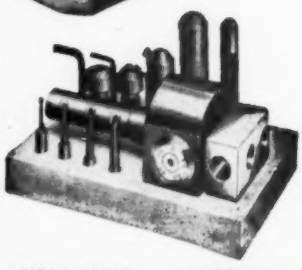
2. will handle a wide variety of work more economically and with greater accuracy . . . in tool room, die shop and in production.

3. has versatility and all-round handling convenience to assure productivity over maximum available machine hours.

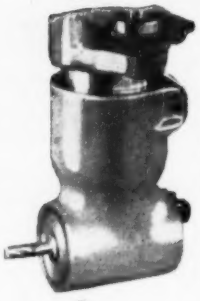
4. can be equipped with attachments specially designed for it and when so equipped offers an outstanding range of utility . . . hence the universal acceptance and phenomenal sales records of this machine.

5. is within the reach of shops large and small because it is moderately priced, making highest returns possible on a reasonable investment in a truly modern machine.

Write us or your nearest dealer for further details, complete description and specifications.

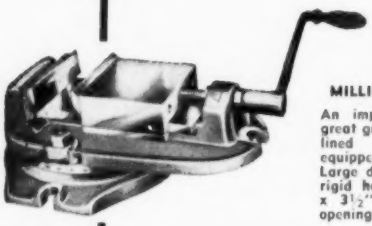


No. 2 BORING HEAD
Boring Tools and Holder provide the means of boring holes up to 6" diameter. Available for use on Bridgeport 1 HP Milling, Drilling and Boring Attachment.



RIGHT ANGLE ATTACHMENTS
(Left) *Heavy Duty* . . . for milling and drilling at right angles. Fits both Master and 1 HP Bridgeport Heads.

(Right) . . . for right angle milling and drilling narrow, deep molds and cavities.



MILLING MACHINE VISE
An improved vise providing great gripping power. Streamlined for attractiveness; equipped with coolant trough. Large diameter screw assures rigid holding. Two sizes: 5" x 3½" and 6" x 5" jaw openings.

Bridgeport MACHINES, INC.
Bridgeport, Connecticut
Manufacturers of High Speed Milling Attachments and Turret Milling Machines

the one source

for "Desegatized" cold work die steels

Latrobe is the one source for these "DESEGATIZED" cold work die steels—each of them uniform in structure, non-deforming and abrasion resistant.

Cobalt Chrome . . . for long-run dies, possesses superior abrasion resistance, holds a super keen cutting edge.
Select B . . . a 5% chromium air hardening die steel, easily machined, long wearing, has maximum toughness.
Olympic . . . a die steel perfectly balanced for toughness, wear resistance and machinability, popular for intricate cold work applications.
GSN . . . the oil-hardening steel in this group, combines high hardness and compressive strength with excellent wear.
BR-4 . . . a "bear for wear"—this patented super abrasion resistant die steel provides the ultimate in wear resistance.

The cost of the finished dies you make or use is far too great for you to gamble with expensive failure during or after fabrication because of inferior raw materials. Avoid this risk—specify "DESEGATIZED" die steels for your next cold work dies.

COBALT CHROME

SELECT B

OLYMPIC

GSN

BR-4

Sole Producers of "DESEGATIZED" Steels

LATROBE STEEL COMPANY

Latrobe, Pennsylvania

Sales offices and warehouses:

BOSTON BUFFALO CHICAGO CLEVELAND DAYTON DETROIT HARTFORD LATROBE (Mill) LOS ANGELES MILWAUKEE NEW YORK PITTSBURGH PHILADELPHIA ST. LOUIS TOLEDO

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WHAT'S THIS?

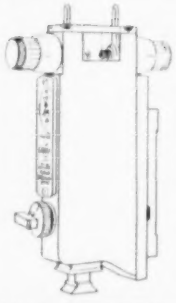
HIGH SPEED 100% INSPECTION

SIGMA

One machine is accurately checking 8 dimensions simultaneously—separating correct, oversize, and undersize parts at a rate of 2100 an hour.

Two girls now handle an inspection job that formerly took six—and human errors have been eliminated.

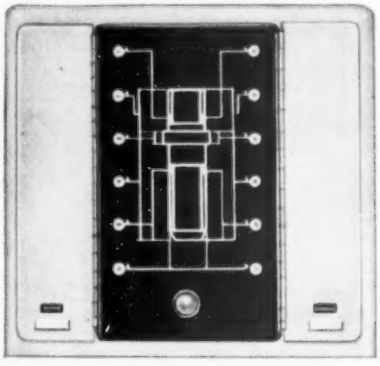
Eight, standard Sigma gauges, like this one: have been mounted together for rapid, accurate inspection of mass produced parts. Each gauge, accurate to within .00005", measures one dimension. More (up to 30) or fewer gauges could have been used, depending on the number of dimensions to be checked. These gauges, with standard Sigma mounting units, and special fixtures where necessary, can be set up to inspect parts a fraction of an inch long, or several inches long, a foot, or longer.



Depending on the arrangement, they can check internal and external diameters, length, depth, or other characteristics. The type of parts and the method of feeding determine inspection rates—hand feed: up to 600/hr.; semi-automatic: up to 900/hr.; fully automatic: up to 3500/hr. or more. Gauges are quickly and easily set to required tolerances and change-over from inspecting one type of part to another can be done within 10 or 20 minutes.

EASY-TO-READ INDICATORS WITH SIGMA EQUIPMENT

The semi-automatic Turbine and Compressor Blade Inspector (left) is an excellent example of Sigma's solution for a difficult inspection problem involving 18 dimensions. Fixtures are replaceable—each machine can inspect a wide range of different type parts. Gauges are connected to a Liquicolumn Indicator which has tubes of colored liquid set beside graduated scales—liquid levels indicate actual sizes of dimensions being checked. Magnifications can be varied easily by the user. Alternate indicator (right) uses electrical signals—green light for acceptable parts, red lights indicate dimensions below tolerances, yellow lights for those over. Built-in counters tabulate the number of parts submitted for inspection and the number accepted.



Contact us and get details on the Sigma equipment best suited to your high speed, multi-dimensional inspection problems.

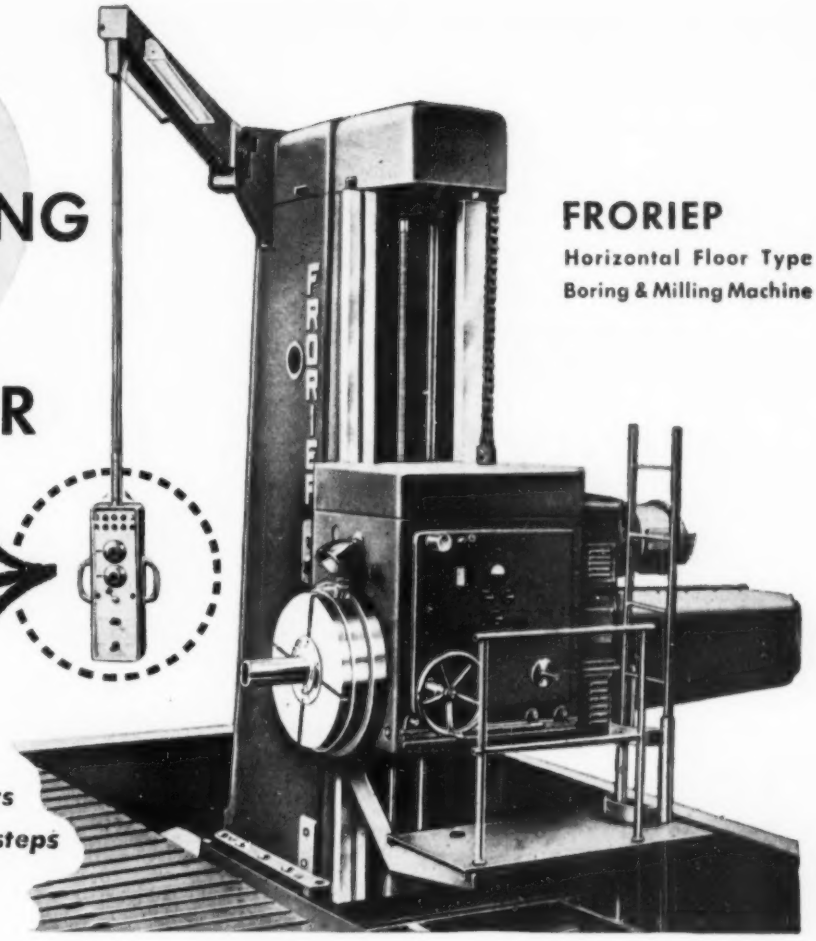
COSA CORPORATION
405 Lexington Ave., New York 17

Your source for all Precision Machine Tools—from Small Bench Lathes to Large Boring Mills

IN DETROIT AREA contact DETROIT-COSA CORPORATION, 16923 James Couzens Highway, Detroit 35, Mich.

HEAVY BORING AND MILLING IS FASTER AND EASIER

this way



FRORIEP
Horizontal Floor Type
Boring & Milling Machine

push button
remote control
eliminates operating levers
. . . reduces time-wasting steps
between workpiece
and operating panel

- Automatic control of speeds, feeds, and movements.
- Optical settings of spindle in vertical and transverse position.
- Guides are automatically locked after each adjustment.
- Spindle and face plate can be operated either separately or simultaneously without special set-up or changes.
- Sturdy, extendible, carrier sleeve supports spindle close to workpiece.
- High cutting capacity with high speed and carbide cutters.
- Thread cutting can be handled easily, without special changes.
- Large boring capacity—four different models with spindle diameters of 5", 6¼", 7½" and 9" respectively.

Perhaps a Froriep machine is what's needed to improve your operation. We will be happy to send more information, or have one of our representatives call on you, if you wish.

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FASTER FINISHING

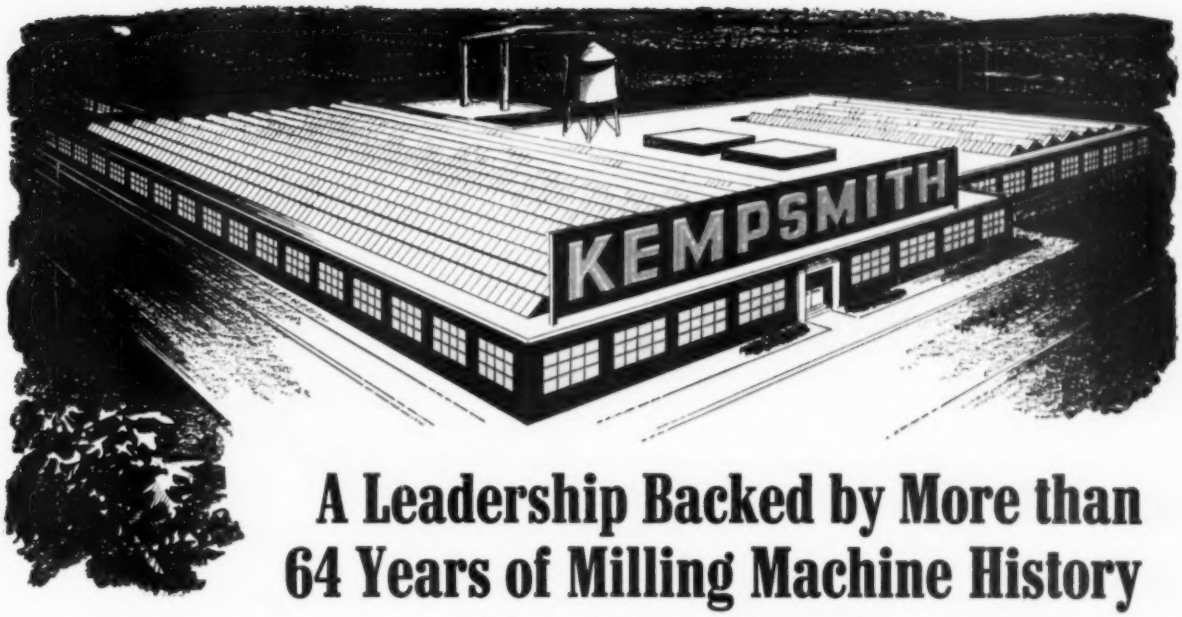
at less cost!

CP Hicycle Portable Electric Tools for grinding, sanding, buffing and polishing finish products faster, increase man hour productivity — and at far less cost!

Lightweight and easy-to-handle CP Hicycle tools operate under constant speed — there's no sag under full load. Their Hicycle induction motor and rugged design assure maximum low-cost power and long service life with minimum maintenance . . . has a solid rotor, no armature to burn out . . . no commutator or brushes to replace. If you use or can use six or more portable tools in one location, we would like to demonstrate the advantages of CP Hicycle tools in operation at your plant. *Chicago Pneumatic Tool Company, 8 East 44th Street, New York 17, N.Y.*

Chicago Pneumatic

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES • ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES



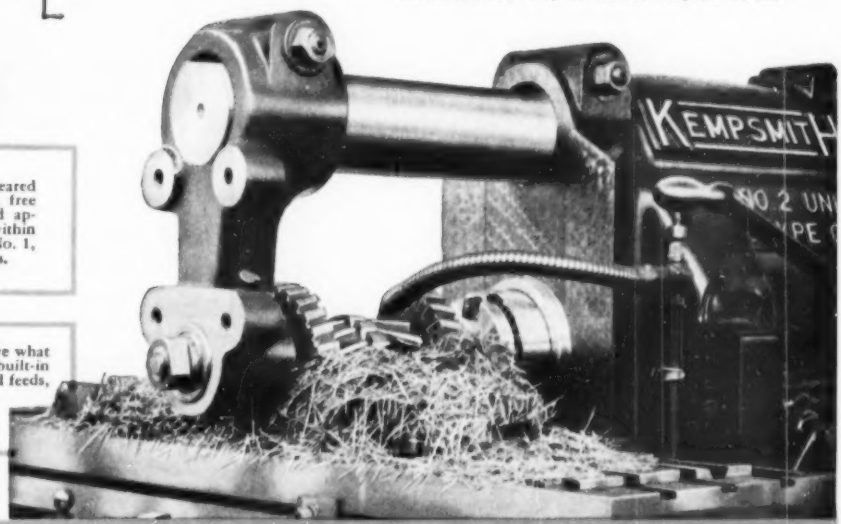
A Leadership Backed by More than 64 Years of Milling Machine History

Back in 1888, Kempsmith Engineers developed and produced the first Kempsmith Miller — a machine that was destined to achieve world-wide fame. The successful performance of this early model encouraged important engineering improvements and refinements resulting in much greater speed and precision in milling operations. Today, Kempsmith continues as a leader in the industry. The ruggedness, precision and ability to take heavy cuts smoothly make Kempsmith Milling Machines ideal for production, toolroom or general purpose milling. If you have a milling problem, consult Kempsmith. Our engineers will gladly give you the benefit of their broad experience in this specialized field.

THE KEMPSMITH MACHINE CO.
MILWAUKEE 14, WISCONSIN, U. S. A.

Kempsmith Type "G" Plain Miller. All geared for positive power and smooth cutting, free from chatter. Note rugged, streamlined appearance. All controls are grouped within easy reach of the operator. Available in No. 1, 2 and 3 sizes, plain and universal models.

Let the chips fly! Kempsmith Millers have what it takes for tough production battles — built-in ruggedness, increased range of speeds and feeds, greater power. Every machine is precision-built, the product of 64 years of milling machine experience.



KEMPSMITH

• Precision Built Milling Machines Since 1888 •

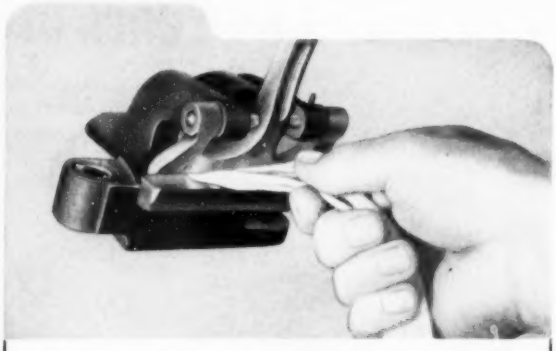
A-7270-1PC

FACTS
...About a Straight Chrome Stainless Steel That Shows Unusual Promise for Your Applications...

If your products or components call for the properties of a stainless steel, here is a stainless that shows unusual promise for many applications. And this steel (Carpenter No. 3, Type 443) is particularly important today for jobs requiring an improved straight chrome stainless to replace the 18-8's restricted by Government Regulations. Carpenter Stainless No. 3 gives you *excellent corrosion resistance, high resistance to scaling,* and a *low annealing temperature (500°F lower than type 304).* Moreover, No. 3 provides machinability comparable to SAE 3145, 3250 or 4650. For more information on No. 3—its mechanical properties, relative workability, corrosion resistance, recommended uses, etc. . . . drop us a line on your Company letterhead for the new descriptive folder on Carpenter No. 3.

Typical user reports on Carpenter Stainless No. 3

This rod end bearing for military aircraft must have heat resistance, ability to resist salt corrosion, good machinability and good cold forging qualities. *Carpenter No. 3* has met all these requirements and is giving an excellent account of itself both as to corrosion and heat resistance at operating temperatures up to 1000°F. Moreover, No. 3 is not subject to intergranular corrosion at this temperature.



These jaw inserts for tenter clips grip and stretch nylon cloth as it rolls through finishing stages. Inserts must be spotless and must resist corrosive action of the dyes because a slight surface defect could break the threads. In addition to good corrosion resistance, *No. 3* gave the inserts high wear resistance for long service—including resistance to abrasion from talc and china clay used in other textiles processed.

A word about availability...

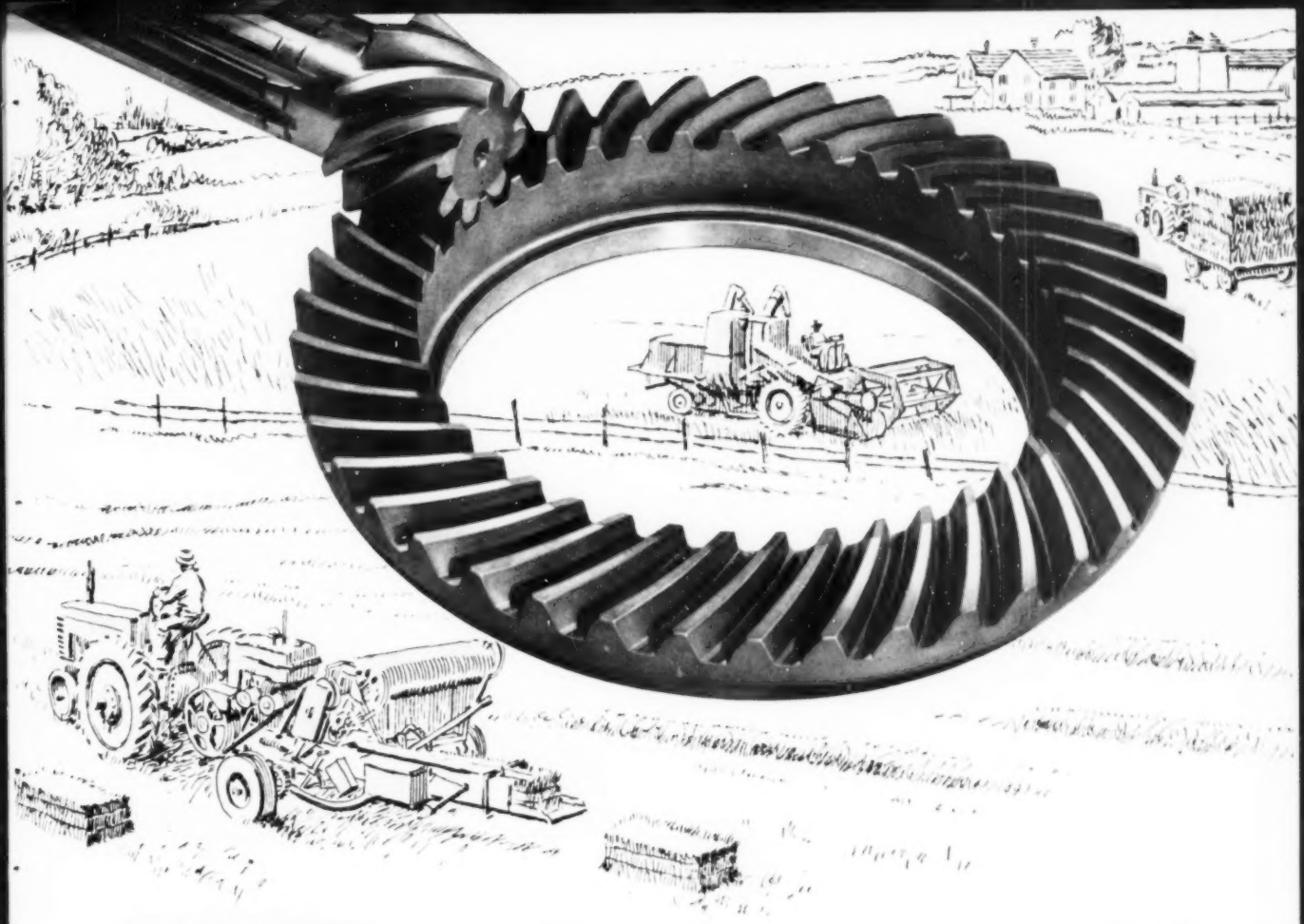
Carpenter Stainless No. 3 (Type 443) is available from Reading Warehouse Stocks, hot rolled annealed in sizes $\frac{3}{8}$" to $2\frac{3}{4}$" round. Other standard bar sizes and finishes, also cold rolled strip, are manufactured to order in minimum quantities of 500 pounds per size. Mill shipments are currently 60 to 120 days from receipt of order and neither priorities nor allotments are required.

THE CARPENTER STEEL CO., 109 W. Bern St., Reading, Pa.
Export Department: The Carpenter Steel Co., Port Washington, N. Y.—"CARSTEELCO"

Carpenter STEEL — **Stainless Steel**

pioneers in improved specialty steels

Call your nearest Carpenter Mill-Branch Warehouse, Office or Distributor



AGRICULTURE—geared to modern production standards

A self-propelled combine, handled by one man, will work rings around the old-fashioned threshing crews of a few years ago. And a modern hay-baler does in a few hours, at a single operation, the tedious work that required days of work not long ago. That's modern production—just as efficient—just as important to the nation's good—as the miracles of America's great industries.

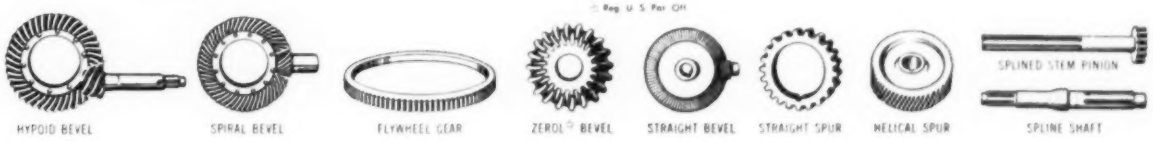
We're particularly aware of this development because "Double Diamond" Gears have grown up with the flourishing farm machinery business. For years "Double Diamonds" have been transmitting power in all kinds of mechanized farm equipment. As the machines grew bigger—as demands of them became more critical—"Double Diamond" Gears have grown in demand. They must stand unusual abuse—long periods of idleness followed by around-the-clock service months on end—and must deliver dependable performance at points many miles from service centers. The fact that "Double Diamonds" have met these requirements, and for so many years, makes them a name to bear in mind when your needs call for gears of that character.

DOUBLE DIAMOND TRADE MARK GEARS

AUTOMOTIVE GEAR WORKS

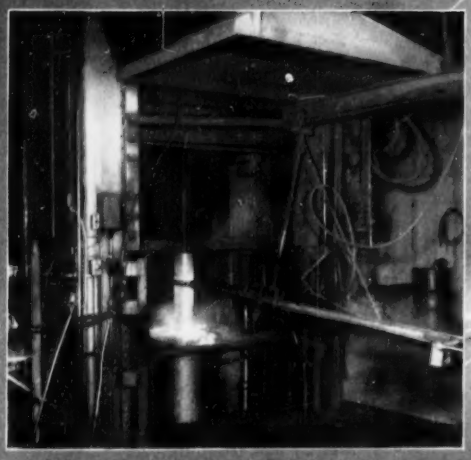
RICHMOND, INDIANA

FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS

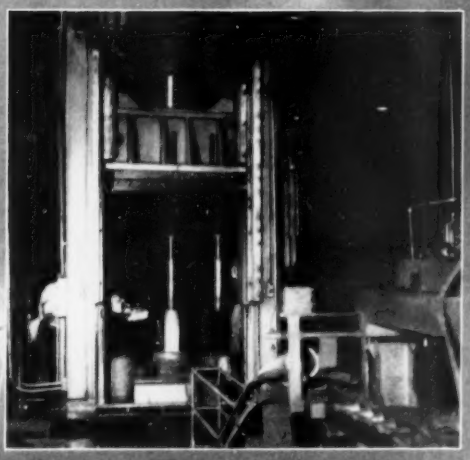


® Reg. U. S. Pat. Off.

MASS PRODUCTION of projectiles with Verson PRESSES AND TOOLING for greater production and lower costs!



Piercing a steel billet in a 600 ton Verson hydraulic press.



Here a Verson hydraulic push through press sizes the cavity and O.D. of the steel forging.

AMONG the many advancements in the press forming of metals that have been pioneered by Verson in recent years are new, improved presses and tooling for producing artillery projectiles. Under the pressure of a combination military and civilian economy, Verson methods have resulted in substantial savings in metal and have made possible great increases in output without a corresponding increase in critical manpower.

Equally important strides have been made in civilian production, too, but tremendous opportunities for modernization and increased efficiency remain. We would like to have the opportunity to discuss press forming of metals with you and help you set up a plan that will enable you to take advantage of the many cost cutting opportunities that are becoming available.

Write, today, outlining your requirements.

A Verson Press for every job from 60 tons up.

Verson

ORIGINATORS AND PIONEERS OF ALLSTEEL STAMPING PRESS CONSTRUCTION

VERSON ALLSTEEL PRESS CO.

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MECHANICAL AND HYDRAULIC PRESSES AND PRESS BRAKES • TRANSMAT PRESSES • TOOLING • DIE CUSHIONS • VERSON-WHEELON HYDRAULIC PRESSES

How a better abrasive begins

Shattering pure diamond bort, hardest material known, at the start of the crushing process in Elgin's laboratories.

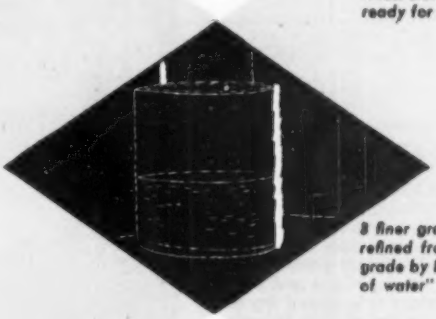
Here is how all Elgin Diamond begins . . . in an $8,000 handful of pure diamond bort. For more than 10 years, every step of production, from bort to finished DYMO compound has been completely performed in the Elgin Diamond laboratories, under the control of Elgin technicians . . . a unique production arrangement permitting maintenance of absolutely rigid quality standards.

Results in hundreds of industrial applications have proved that DYMO finishing is the sure way to reduce costs and produce a better finish every time . . . in less time! Write for specific application data today.

Every day, more and more leading producers find that it's best to FINISH WITH DIAMOND . . . ELGIN DIAMOND.

Ask for a free demonstration!

Diamond powder is mechanically sieved into ten grades. The finest sieve grade shown here is ready for further processing.



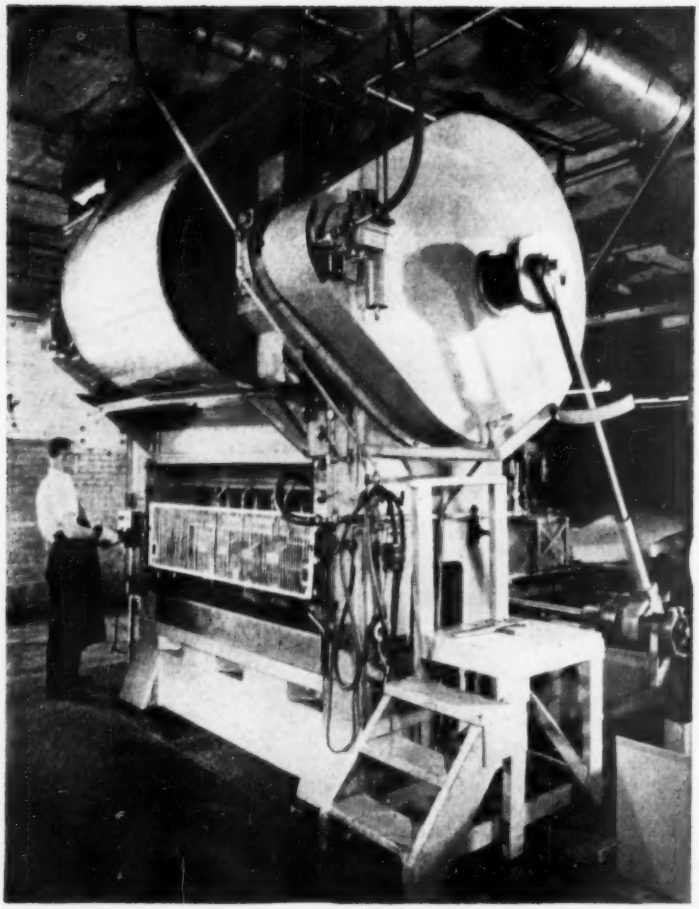
8 finer grades are further refined from the finest sieve grade by Elgin's "layers of water" process.

ABRASIVES DIVISION

ELGIN NATIONAL WATCH COMPANY

ELGIN, ILLINOIS

Final inspection assures particle uniformity and grading accuracy—for finer, faster finishes at less cost!



All main bearings and slideways protected by Minster's automatic oil lubrication system with return. The oil lubrication to the main bearings is under heavy pressure. Oil to the slideways and other bearings is supplied by the same system but is under gravity flow.

MINSTER PRESS CUTS 80,000 POUNDS OF STEEL DAILY FOR 6 YEARS WITHOUT A BEARING FAILURE

Complete, convenient protection to main bearings and slideways is a "must" with modern automatic production presses. You get that protection with Minster's automatic oil lubrication system, first installed on a Minster press in 1939.

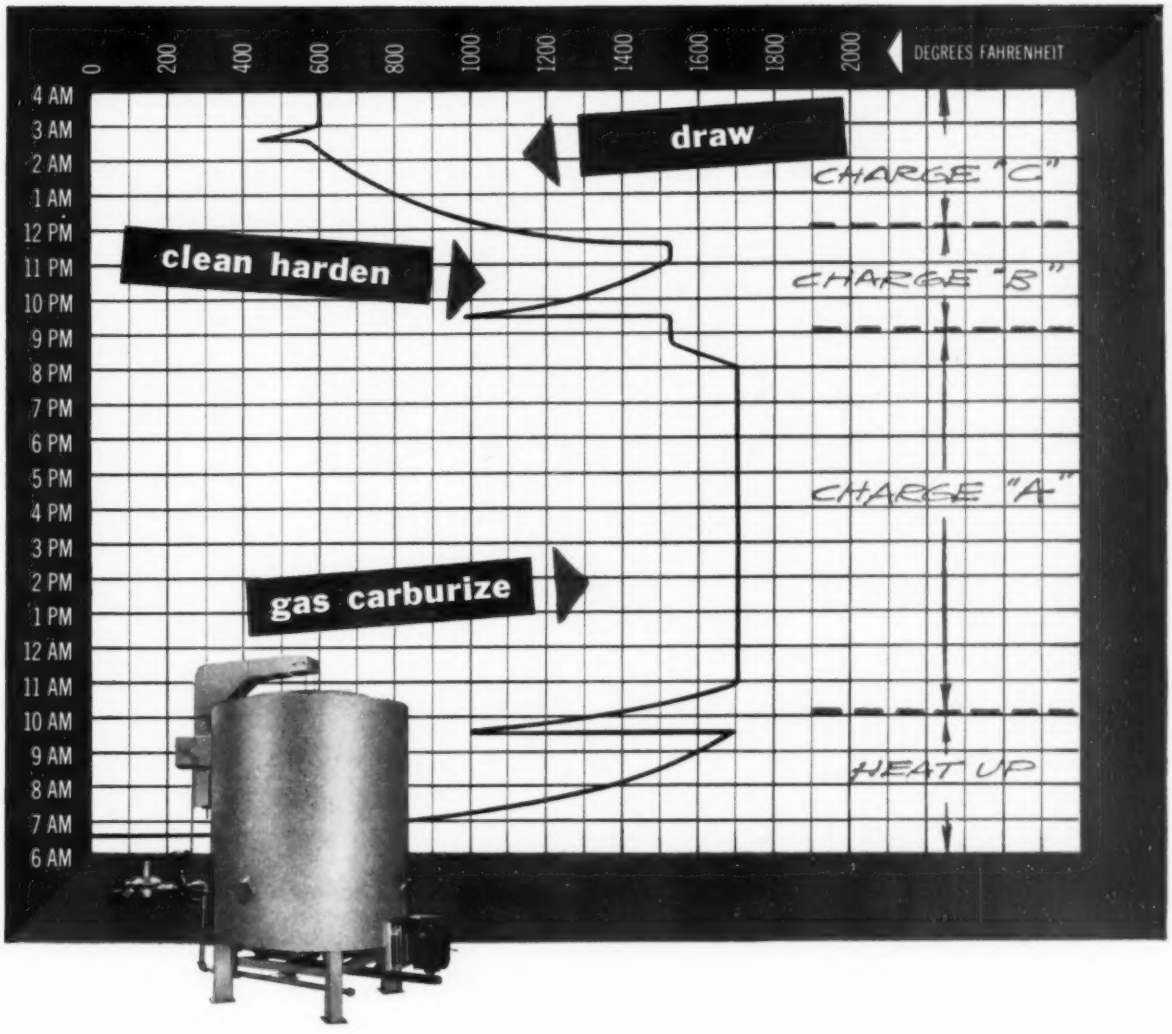
Typical performance record is that of the press illustrated . . . 80,000 lbs. of steel cut up daily for six years without a single bearing failure.

Minster's automatic oil lubrication system creates a protective film on bearing and slideway surfaces having extremely close clearances. It proves the necessary frequency of lubrication as well as eliminates possible operator forgetfulness. It is a return system with central pump, two filters and reservoir.

Automatic oil lubrication with return is an important contribution pioneered by Minster. It is another example that proves the statement: Minster is first in press design.

MINSTER
FIRST IN Press DESIGN

THE MINSTER MACHINE COMPANY, MINSTER, OHIO



in one atmotrol pit furnace

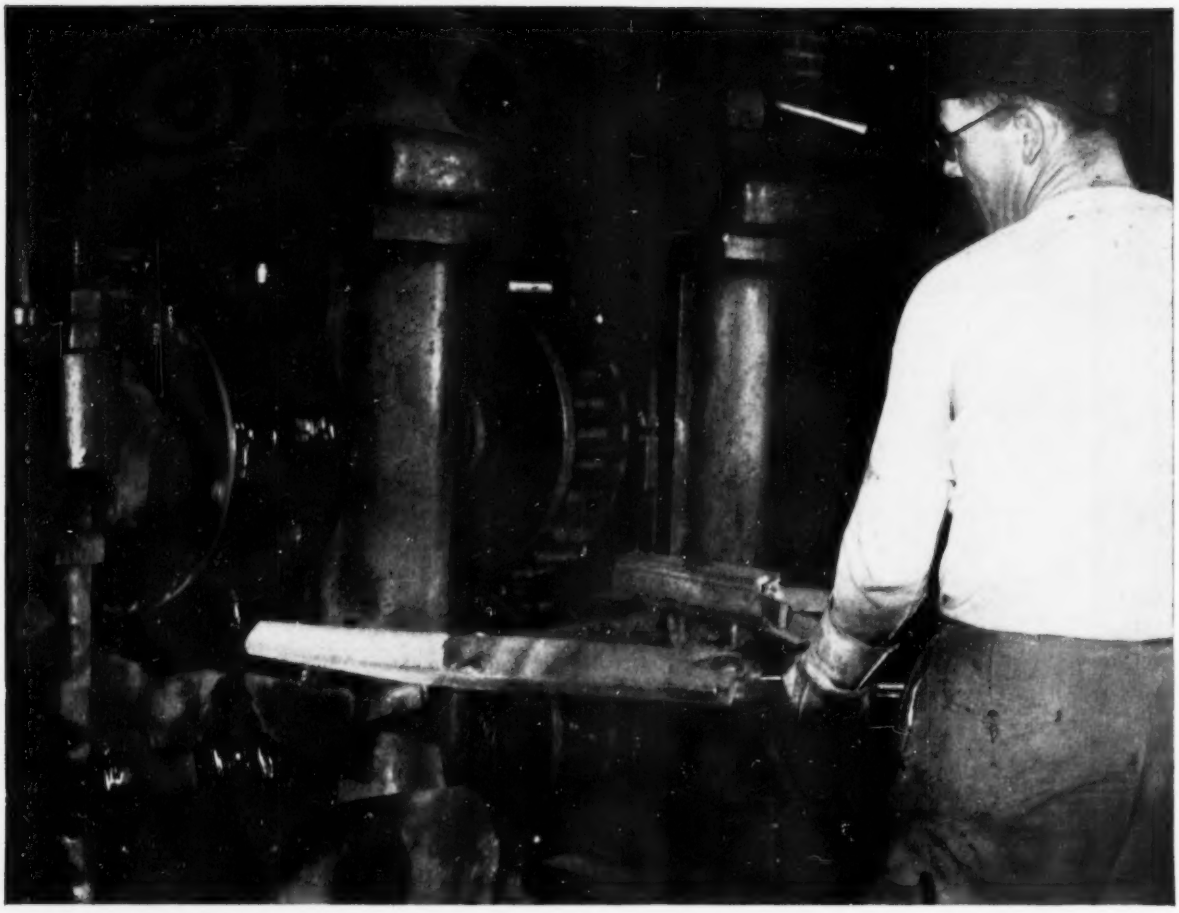
How versatile can a batch furnace get? Here's a good answer: a single Surface Combustion "Atmotrol" pit-type controlled atmosphere furnace can clean harden, carburize, and draw a wide variety of parts with maximum flexibility and shortest interruptions, as shown in the chart above. Furnace operation can be scheduled to deliver maximum output when you need it. For clean hardening and gas carburizing, team up the "Atmotrol" with a Surface prepared atmosphere generator. Lower part of furnace is easily accessible in the basement for routine servicing.

Whatever your heat treat requirements, ask us for *advance proof of performance* in Surface Combustion Standard Rated Furnaces. Write for Literature Group H53-7.

SURFACE COMBUSTION CORPORATION • TOLEDO 1, OHIO

ALSO MAKERS OF

Kathabar HUMIDITY CONDITIONING *Janitrol* AUTOMATIC SPACE HEATING



10 TIMES THE PRODUCTION LIFE

FROM THESE "CAST-TO-SHAPE" SWAGING DIES

SEND FOR THIS NEW CATALOG
"FORGING AND CASTING PRODUCTS"

It's hot off the press with full details on FCC Air Hardening, Oil Hardening and other Cast-to-Shape Tool Steel Specialties that can save you time and money . . . also Composite Die Sections, and Smooth-Hammered Forgings in a wide range of tool and stainless steels. *Don't wait—get your copy NOW.*

Write Today

ADDRESS DEPT. AM-43

The John Deere Plow Works of Deere & Company formerly used cast grey-iron dies to swage AISI 1070 F steel plow beams. Die life was, at best, a mere six weeks or about 8,000 parts.

They switched to A-L CAST-TO-SHAPE swaging dies of FCC No. 66 tool steel, hardened and drawn to 57-58 Rockwell "C". The new dies ran *fourteen months*—eight hours a day, five days a week—before redressing was necessary. Approximately *83,875 Parts* (over ten times the production) were swaged in that period! Production has been maintained at that level since.

You, too, can save time and money with the modern FCC CAST-TO-SHAPE method of tool and die making. Don't forget, you also buy *less* steel and reduce machining costs. It's a matter worth investigating. ● Check with your A-L representative TODAY . . . or write *Allegheny Ludlum Steel Corporation, Oliver Building Pittsburgh 22, Pennsylvania.*

For complete **MODERN** Tooling, call

Allegheny Ludlum

AL
FINE TOOL STEELS SINCE 1854

W&D 4691

here it is

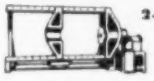
Rodgers new 3 in 1

OPEN YOKE PRESS

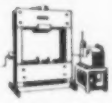
Here is an all-around press available in 100, 200, 300 and 400 ton capacities. It incorporates features that could be found only on standard shop and platen presses. Now at the price of one press you can perform the work formerly done by three.

Performs the work of three separate presses!

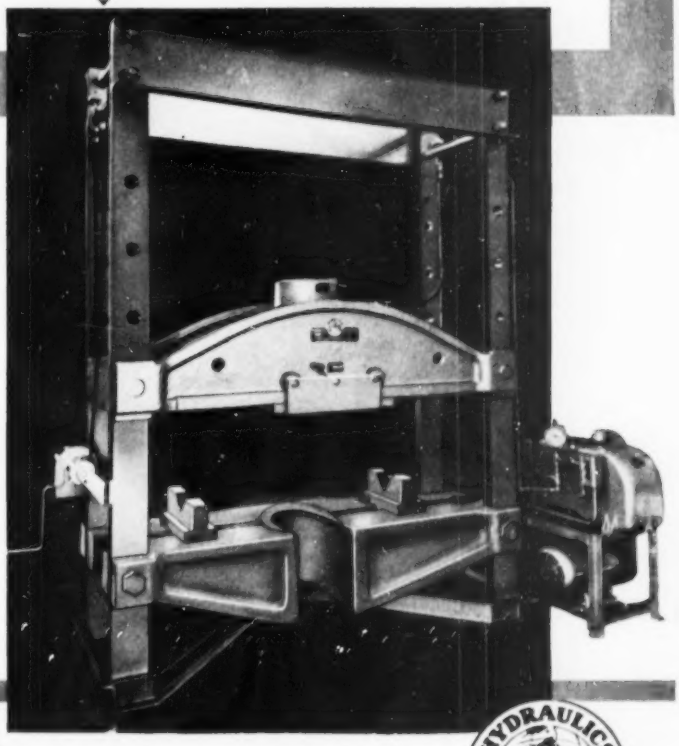
1—SHOP PRESS . . . Incorporates all of the features of the best standard shop presses.



2—FORCING PRESS . . . Practically every job that can be done on a regular forcing press can be handled on this new press.



3—PLATEN PRESS . . . Full pressure can be applied across the entire width of the machined yoke bed.



Check these outstanding features:

- Yoke member bed machined over entire surface.
- Rugged, machined "V" blocks accurately centered in yoke member groove.
- Wear collar supplied for inserting in yoke recess.
- Bed plate insert covers yoke recess to provide continuous flat working surface.
- Recess takes yoke adapters normally used with Rodgers Forcing Presses.
- Movable cylinder with locking device provides full pressure across entire width of press.
- Clear, open ends permit entrance of long material.
- Choice of Hand Operated or Power Driven Hydraulic Pumps.
- Hand operated winch raises and lowers bolster.

Write for Catalog 315A today!

Rodgers Hydraulic, Inc.

HYDRAULICS Rodgers KEEP THE WORLD MOVING

7407 Walker Street, St. Louis Park, Minneapolis 16, Minnesota

wherever you are...

it's still the same

And that goes for Crucible's REX High Speed Steels, too. For all of REX High Speed Steels are subjected to extensive metallurgical tests – microscopic examinations, chemical analysis, ultra-sonic checks both in the billet and finished form, magnetic analysis, and strength tests – to assure you of uniform quality regardless of when or where you buy them.

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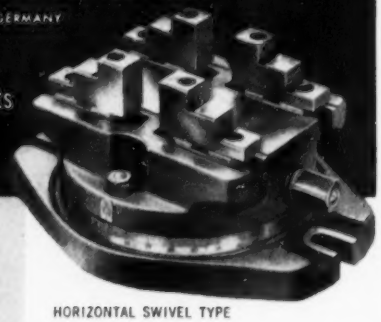

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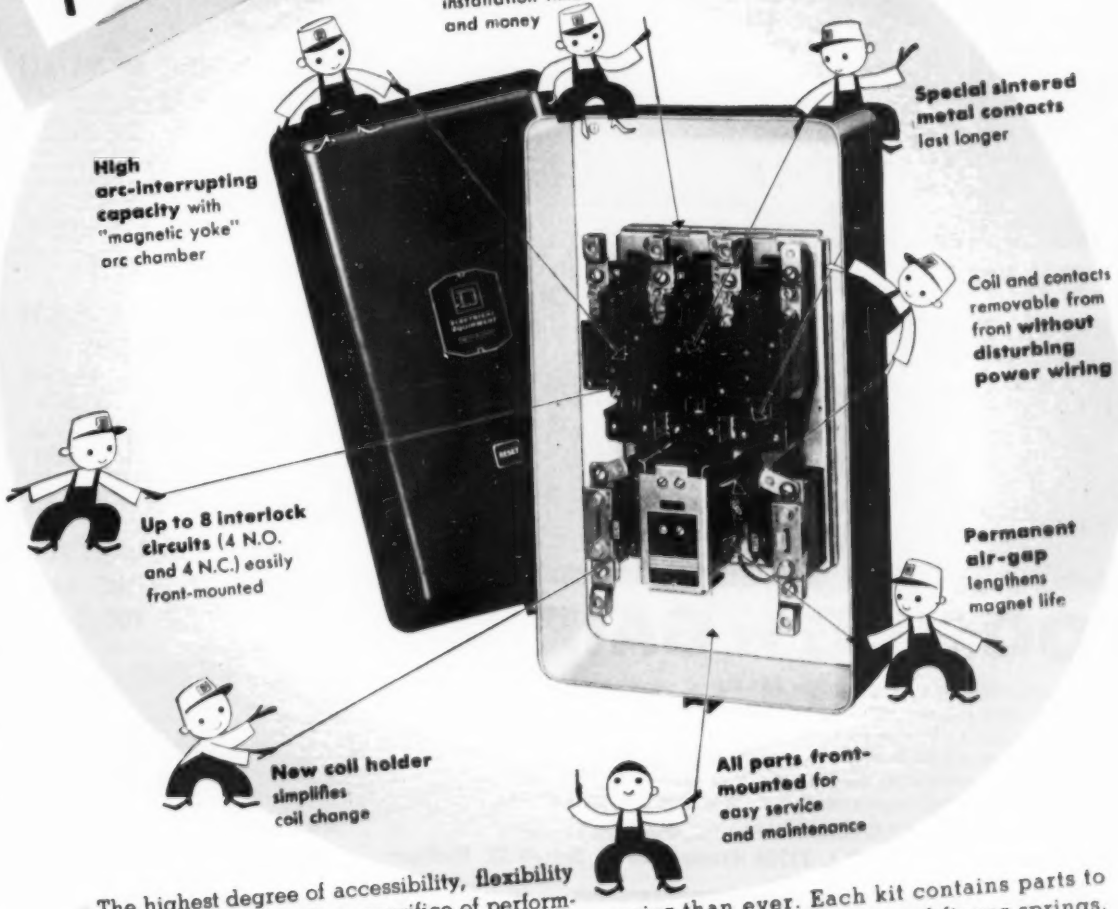
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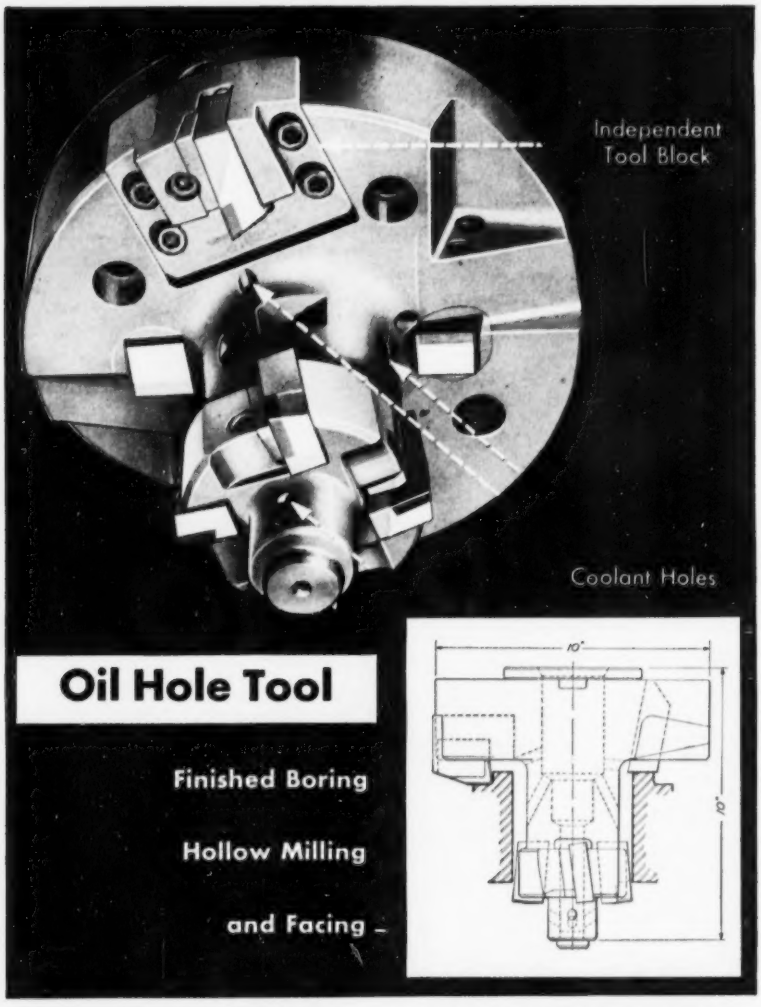

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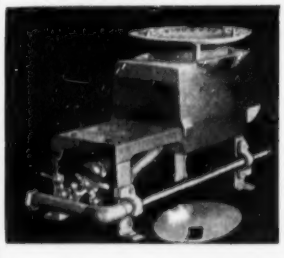

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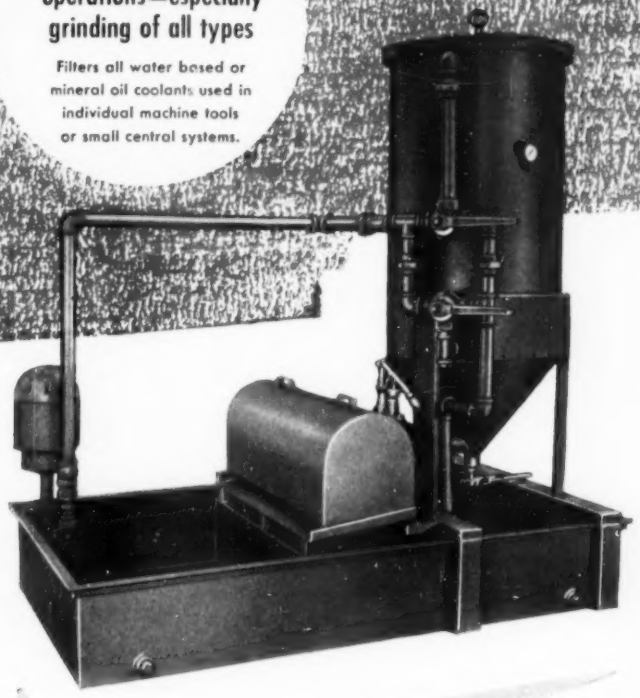

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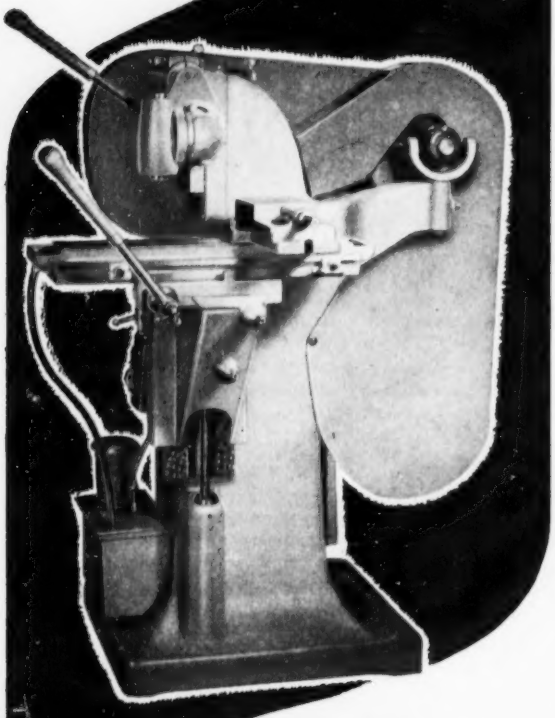

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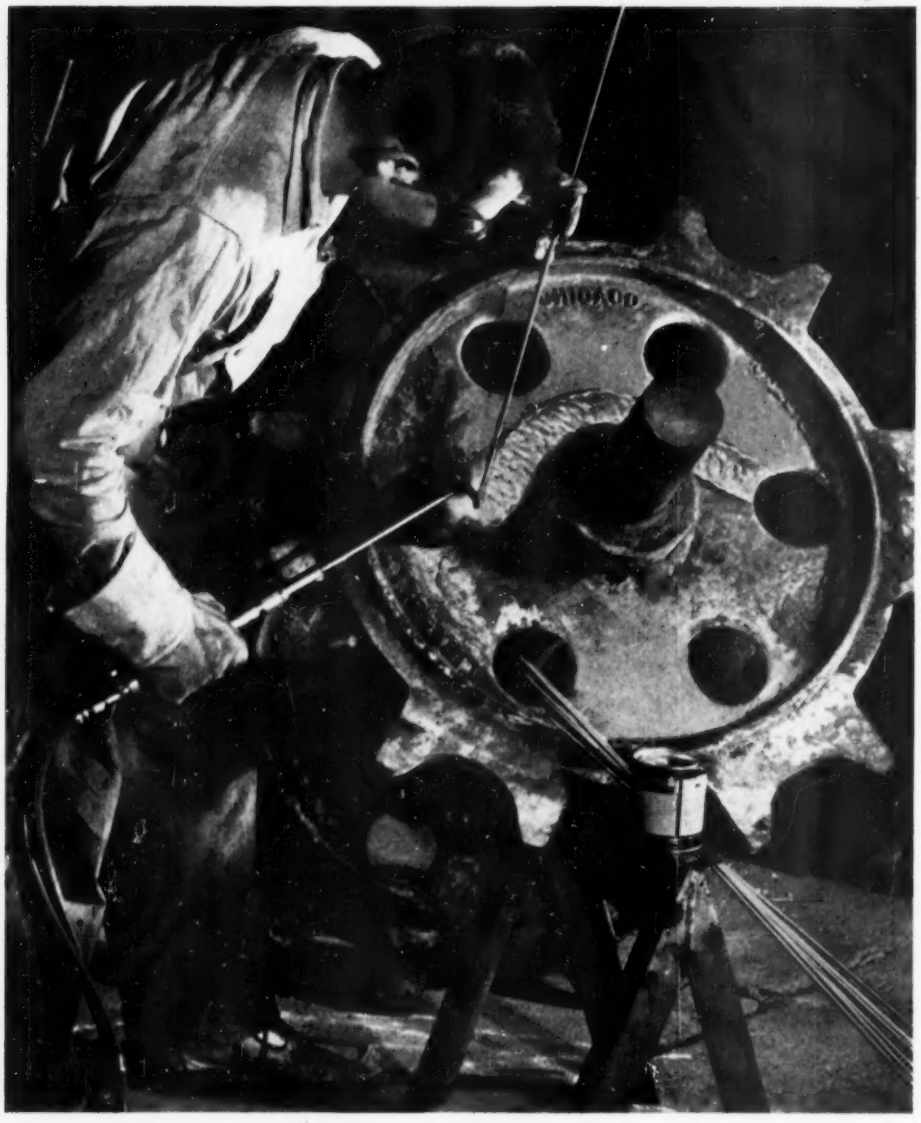

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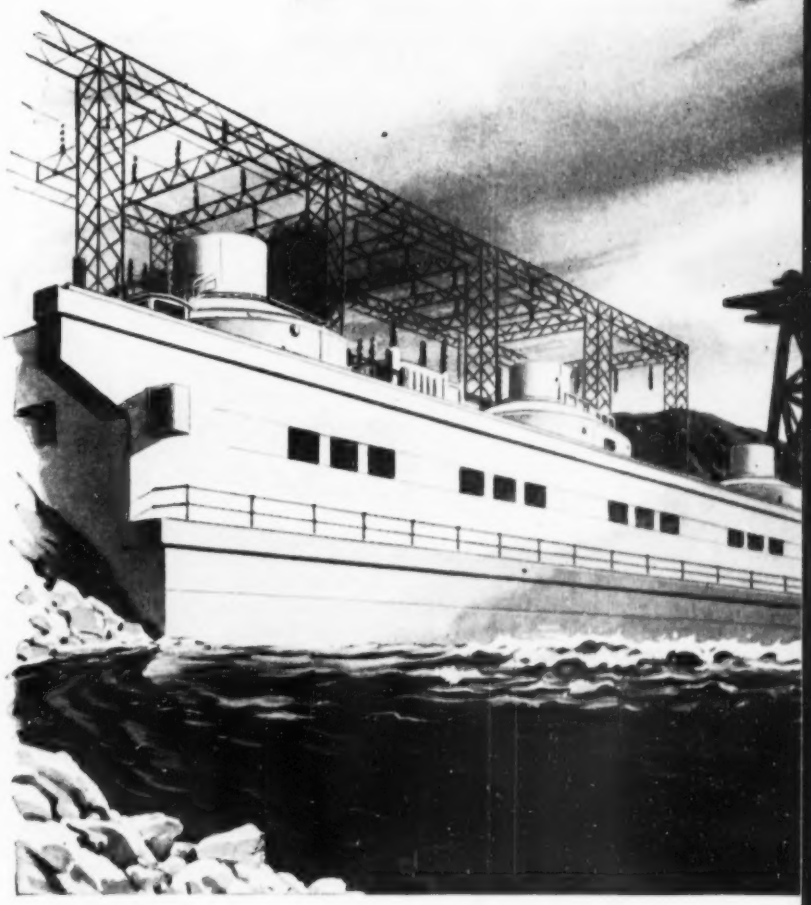

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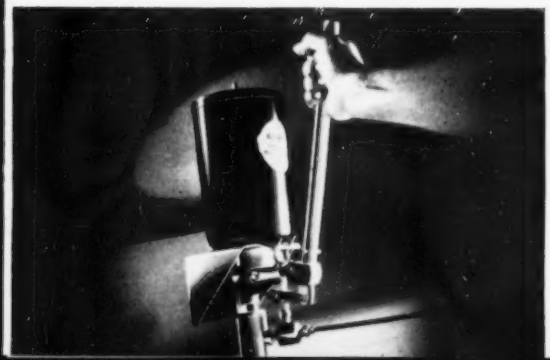

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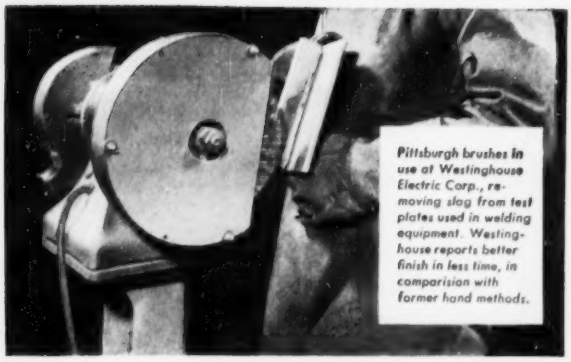

Pittsburgh brushes in use at Westinghouse Electric Corp., removing slag from test plates used in welding equipment. Westinghouse reports better finish in less time, in comparision with former hand methods.

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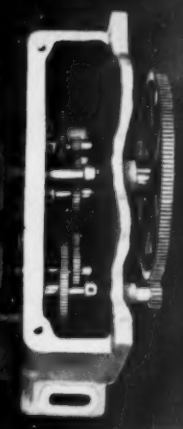

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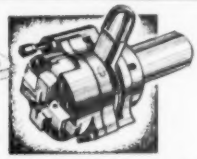

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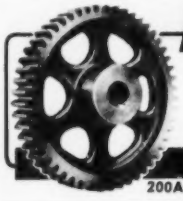

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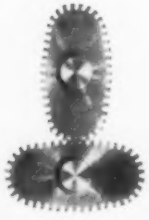

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GEARS OF ALL TYPES and MATERIALS . . .

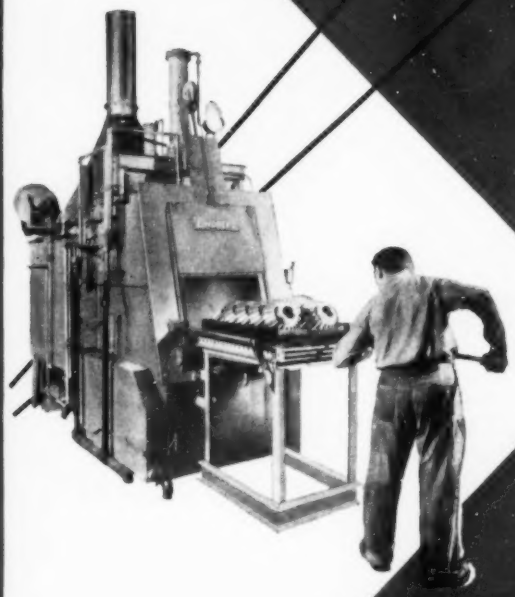
produced promptly in ANY QUANTITY

BILGRAM GEAR & MACHINE WORKS

1217-35 Spring Garden, Philadelphia, Pa.

5 FURNACES IN ONE

the LINDBERG Carbonitriding Furnace



Yes, it's many furnaces in one! It's designed not only for carbonitriding . . but also for hardening, carburizing and carbon restoration. It's self contained . . it's easy to maintain!

10 reasons why Lindberg Carbonitriding Furnaces are better:

1. Heating is by new type, gas-fired, vertical radiant tubes. They weigh only 29 pounds each . . can be changed in two minutes. Just lift out the old one, and lower the new one in its place.
2. Vertical radiant tubes last longer . . often two or three times as long.
3. Quench tank is built-in . . no costly excavation or piping necessary. Distortion is minimized because quenching takes place within furnace structure, and heated work is never exposed to outside air.
4. Quench tank has fin type oil cooler . . maintains oil at proper temperature for quenching.
5. Specially designed purge chamber purges work loads before they enter heating chamber.
6. Special check-light system tells you where charge is at any given time.
7. Control of heating and quenching cycle is automatic. Uniform case depth is assured because each charge remains at heat same length of time.
8. Depending on your production requirements Lindberg Carbonitriding Furnaces are made for automatic, semi-automatic, or manual charging.
9. You're not experimenting with Lindberg Carbonitriding Furnaces. They've been tested . . under three years of rough operating conditions.
10. The famous Lindberg "Hyen" generators which supply atmosphere for Lindberg Carbonitriding Furnaces are instantly adjustable for many different types of atmospheres.

For full details, ask for bulletin 1241.

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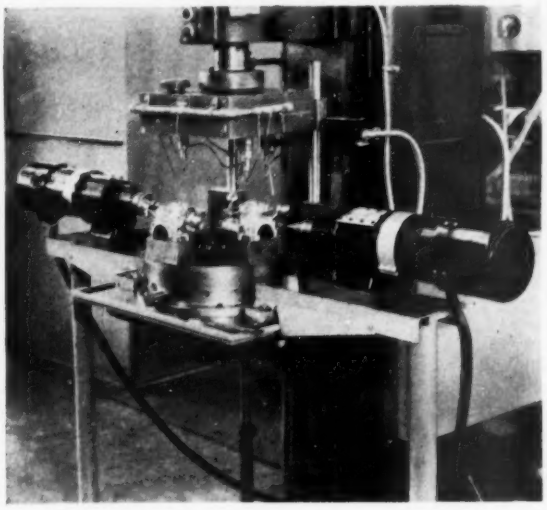
Lindberg Engineering Company • 2450 West Hubbard Street • Chicago 21, Illinois

GOVRO UNITS
COMBINED WITH OTHER OPERATIONS

ON parts requiring multiple-spindle drill head operations the Johnson Motors Division has ingeniously incorporated two Govro Drilling Units to drill holes on a side face simultaneously with the multiple-spindle operation, thus obtaining these additional operations with no labor costs.

A second multiple-spindle machine taps the top holes while two Govro Tapping Units tap the side holes simultaneously.

These small, rugged, compact Units can be mounted in conjunction with major operations to obtain small secondary operations without separate set-ups or labor costs.



If you have similar operations we shall be pleased to recommend the proper Automatic Units. Literature on request.

WRITE FOR *Literature*

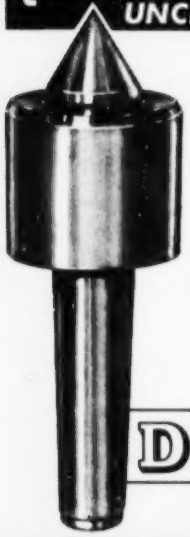
Automatic DRILLING UNIT

GOVRO-NELSON CO.
Machinists of Precision Parts for 30 Years
1933 ANTOINETTE DETROIT 8, MICH.

OUTLASTS DEAD CENTERS MANY TIMES OVER!

QUADRO PRECISION LIVE CENTERS

UNCHALLENGED ACCURACY!



Get every dollar's worth of production from QUADRO PRECISION LIVE CENTERS—designed to support the HEAVIEST load at HIGHEST speed for the LONGEST time! Guaranteed accurate to .00005"—they will outlast dead centers by far!

Each QUADRO CENTER completely eliminates friction—two double row pre-loaded ball bearings absorb combined radial end thrust. You'll discover its remarkable efficiency on a lathe, miller OR ANY OTHER MACHINE TOOL!

TODAY—see your regular supply dealer for Complete Facts or write to:

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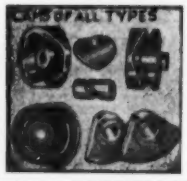
TOOL & MACHINE CO., INC.
496 Broadway, Brooklyn 11, N. Y.

"TWO DECADES OF IMPORTANT TOOL PARTS PRODUCTION"



A SPECIALIZED CAM MILLING SERVICE, SPOT AND BUTT WELDING, TURNTABLES, POSITIONERS FOR BRAZING, SPRAYING, WELDING, SOLDERING OVER 100 TYPES CONTRACT PRODUCTION, SPECIAL AUTOMATIC MACHINES.

EISLER ENGINEERING CO., INC.
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choose FERRACUTE INCLINABLES
Fast . . . economical . . . dependable
Complete line of mechanical presses. Since 1863
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RIVETERS — PIONEERS in their line—head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method—Sizes to meet all needs—Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

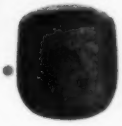
THE GRANT MFG. & MACHINE CO.
15 Gillman Ave., Bridgeport, Conn., U. S. A.

Tool Steel Topics

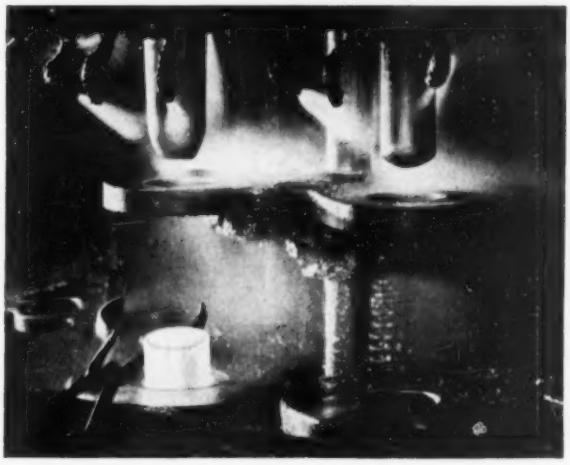
BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

FOR 81 MM MORTARS—Steel slugs, at left, are cut from 2½-in. round bars of carbon steel; next, the slugs are upset (center).



Heated to 2100 F, the upset slugs are extruded and formed into rough cups (right). The final product, not shown, is then cold-shaped to close tolerances.



SCENE OF ACTION—In this 1600-ton press, the upset slugs, heated to 2100 F, are cupped by the extruding punch at upper right. The forming die, at upper left, then shapes the cupped piece to more accurate shape. High-pressure jets of mixed air and water keep the punches and dies cooled to about 550 F. Punches and dies, made from Cr-Mo-W tool steel, are hardened and double-tempered to produce a hardness of Rockwell C-50.

BETHLEHEM TOOL STEEL ENGINEER SAYS:

Care is required when cutting tool steel with abrasive wheels.

Cutting annealed tool steel with an abrasive cut-off wheel can cause both fine cracks and scorching on the surface unless certain precautions are observed.

Proper wheel speeds and the liberal use of coolant will help to avoid this sort of trouble. If these precautions are ignored, the excessive heat generated is often so intense that an annealed steel is actually hardened.

If the steel is heated above the critical range, the rapid conduction of heat to the adjacent cold steel serves as a quench. Hardnesses above Rockwell C-60 are often produced on surfaces which have been cut in this manner. Attempts to drill or machine such surfaces will result in trouble because the hardness is often high enough to make machining impossible.

An experienced spark tester can identify the basic composition of this bar of tool steel. Can you?

Slugs Formed Into Mortar Shells 500 an Hour, at 2100 F

Production men at the Ordnance Division of Rheem Mfg. Co., San Pablo, Calif., have good reason to be pleased with the long service life they've been getting from extrusion punches and forming dies made from our Chrome-Moly-Tungsten hot-work tool steel.

Hot slugs, to be processed into mortar shells, are extruded into a cupped shape by punches at the rate of 500 an hour. Because they are in such frequent contact with the slugs, heated to 2100 F, the temperature of the punches seldom falls below 550 F, even though the punches are sprayed with an air and water mixture.

The production men and tool designers at Rheem figured the punches would produce a maximum of 3,000 to 5,000 pieces before failure. Instead, one punch extruded 30,860 pieces; others produced 14,000 and 16,000.

The hot-forming dies, which form the cupped piece into more finished shape, are subjected to the same high temperatures. After forming 15,000 cups, one of these dies was polished and put back in service; it turned out another 63,000 pieces before it showed much wear.

Cr-Mo-W is an all-around hot-work steel containing 5 pct chromium. It's especially suited for jobs that involve both shock and repeated cycles of heating and drastic cooling. It's easy to machine and heat-treat; and it's highly resistant to heat-checking when water-cooled.

Cr-Mo-W hardens in air and distorts very, very little during heat-treatment. It's widely used for gripper and header dies, shear blades, trimmers, die-casting dies. Like to have more details? Write for Booklet 265. Address your request to Publications Dept., Bethlehem, Pa.

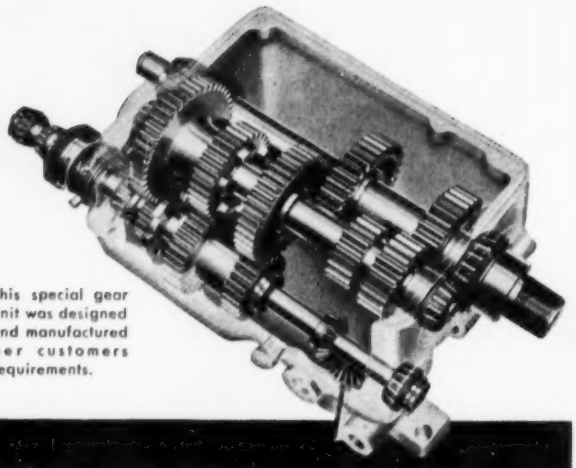
KNOW YOUR SPARKS

The exact composition of a tool steel cannot be determined except by a laboratory analysis. However, the spark test is often convenient when bars of several different compositions become mixed.

Even amateurs sometimes use the spark test with good results by spot-grinding a bar of known analysis and comparing the spark stream with bars of unknown composition. A small-diameter grinding wheel, rotated at high speed to produce a generous flow of sparks, is recommended for this test. Note the illustration.

Some elements such as carbon, tungsten or molybdenum have characteristic appearances in the spark stream. Other elements such as silicon and nickel modify the appearance of other elements.

Perhaps you are expert enough to recognize the sparks at the left. They indicate a steel having a fairly high carbon content (0.90 pct) and some tungsten (0.50 pct). It's our BTR, most popular of the general purpose, oil-hardening grades.

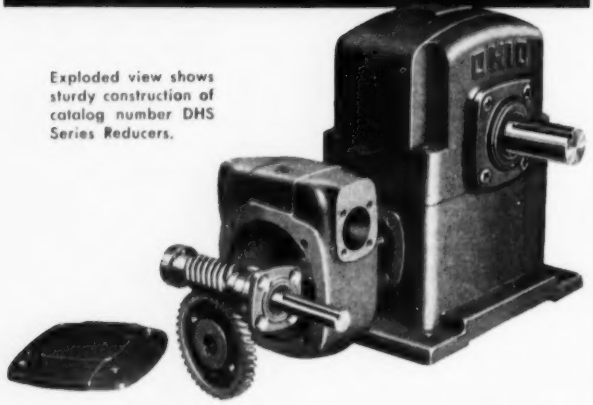


This special gear unit was designed and manufactured per customers requirements.

SPECIALIZE

GEARS OHIO REDUCERS

STANDARDIZE

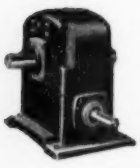


Exploded view shows sturdy construction of catalog number DHS Series Reducers.

PROTECT YOUR PRODUCT — specialize with OHIO GEAR special gears and special speed reducers engineered to your specifications and dimensions.

REDUCE MAINTENANCE AND MANUFACTURING COSTS — standardize with OHIO GEAR stock gears and stock speed reducers for years and years of dependable rugged trouble-free service.

NEW METHODS — modern machinery, sound engineering, approved and thoroughly tested materials enable our Distributors and Representatives to give you prompt, intelligent and helpful attention. Call him or write direct.



ESTABLISHED 1918

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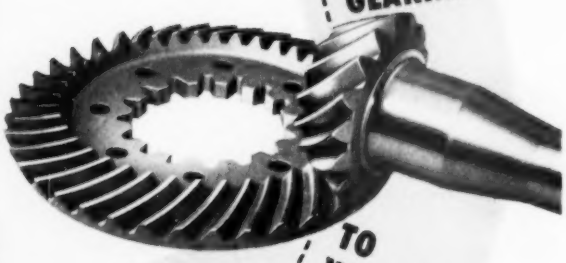
OHIO GEARS

PRECISION

SPIRAL BEVEL GEARING



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Full Range To 30" Diameter

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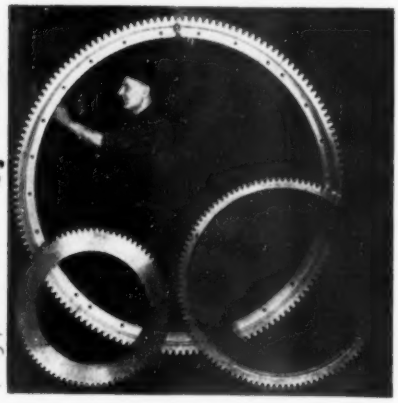
Three Finished Performers



The solid and split-ring spur gears illustrated are ready to give precise, enduring performance on Rotary-type drums. Stahl-built is precision-built, from selection of the steel to final inspection and shipment. For accurate, long-lasting gears in any quantity, produced economically and quickly, you'll be ahead by getting Stahl's estimate first.

SPURS TO 72" PD, 1 DP

BEVELS TO 54" PD, 1 DP

SPIRAL, HELICAL and WORM GEARS TO 48" PD, 2 DP

CONTINUOUS-TOOTH HERRINGBONE TO 60" PD, 2 DP

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RACKS TO 20 FT. LONG, 3 DP

SILENT GEARS; RAWHIDE, BAKELITE, FABROIL

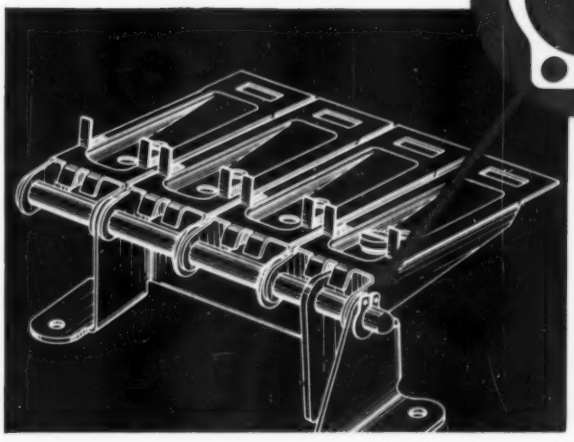
HEAT-TREATED, CASE OR FLAME HARDENED GEARS — OF CARBON OR ALLOY STEEL

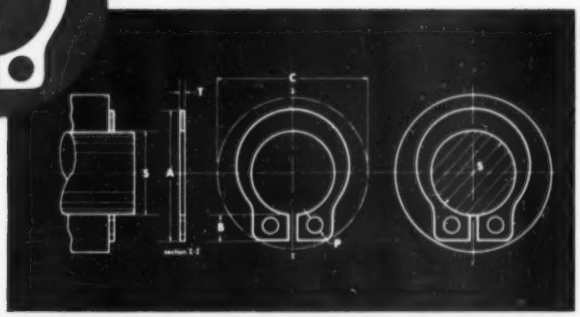
Stahl

GEAR & MACHINE COMPANY

3901 Hamilton Ave. Cleveland 14, Ohio

New Waldes Truarc GRIP Ring requires no groove, holds fast by friction, can be used over and over again





Ring # 5555		5555-12	5555-13½	5555-18	5555-25	5555-31	5555-37
SHAFT DIAMETER	Fract. Equiv. S	1/8"	—	3/16"	1/4"	5/16"	3/8"
	Dec. Equiv. S	.125	.136	.187	.250	.312	.375
	TOL.	±.002	±.002	±.002	±.002	±.003	±.003
RING DIMENSIONS	Thickness T	.025	.025	.035	.035	.042	.042
	TOL.	±.0015	±.0015	±.002	±.002	±.002	±.002
	Length A	.268	.285	.364	.437	.553	.626
	Lug B	.078	.078	.097	.097	.141	.141
	Hole P	.042	.042	.042	.042	.078	.078
	Min. Ring Clear C	.33	.34	.44	.50	.67	.73
Approx. Ultim. Thrust Load (Lbs)		20	20	25	35	50	60

The Waldes Truarc Grip Ring is a new, low cost fastener that provides a positioning shoulder secure against moderate thrusts or vibration. Installed on a straight ungrooved shaft, the Truarc Grip Ring can be assembled and disassembled in either direction with Truarc pliers.

The Grip Ring can be installed tightly against a machine part in order to take up end-play. The basic Truarc design principle assuring complete circularity around periphery of the shaft and the ring's unusually large radial width combine to exert considerable frictional hold against axial displacement. The ring can be used again and again.

Find out what Waldes Truarc Retaining Rings can do for you. Send us your drawings. Waldes Truarc engineers will give your problems individual attention without obligation.

SEND FOR NEW CATALOG

WALDES

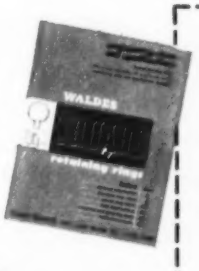
TRUARC

REG. U. S. PAT. OFF.

RETAINING RINGS

WALDES KOHINOOR, INC., LONG ISLAND CITY 1, NEW YORK

WALDES TRUARC RETAINING RINGS AND PLIERS ARE PROTECTED BY ONE OR MORE OF THE FOLLOWING U. S. PATENTS: 2,382,947; 2,382,948; 2,415,852; 2,420,921; 2,428,341; 2,439,785; 2,441,868; 2,455,165; 2,483,390; 2,483,393; 2,487,802; 2,487,803; 2,491,306; 2,509,081 AND OTHER PATENTS PENDING



Waldes Kohinoor, Inc.,
47-16 Austel Place, L.I.C. 1, N. Y. AM-075

☐ Please send me sample Grip-Rings (please specify shaft size _____)

☐ Please send me the complete Waldes Truarc catalog.

(PLEASE PRINT)

Name _____

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Company _____

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Here's another reason it pays to get a proposal from Fosdick

We put a table on the

When Fosdick engineers put a table on the radial, a unique and basic machine tool was born. This machine combines the best features of two proven, reliable designs. It gives you the capacity and flexibility of a radial—the rigidity, compactness and convenience of an upright. It's the machine you need when you want versatility and economy in limited floor space.

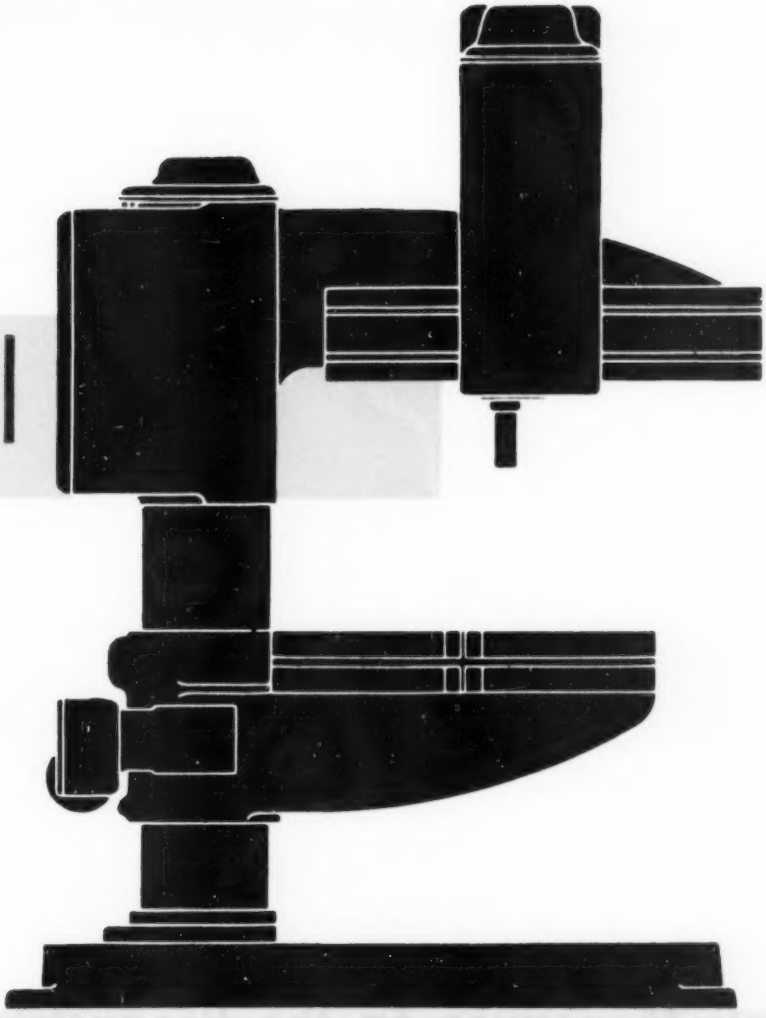
The arm of the Sensitive Radial swings 360° on the rigid one-piece column. Controls are always at the same convenient height. Work is placed on the adjustable table, *or* on the base with the table swung out of the way. Drills up to 1½". 12" column, 3' or 4' arm, nine speeds, four feeds, 3 hp motor, reversing motor control for tapping.

For full information on the Sensitive Radial, ask for Bulletin SRA

to give you

Variety problem solved at Lodge & Shipley

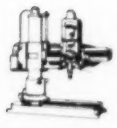
Building 46 lathe models from 14" to 60" requires plenty of production versatility. To drill and tap a broad variety of vari-shaped parts, *Fosdick's proposal* recommended the Sensitive Radial. Now Lodge & Shipley assigns tool blocks, levers, cam plates, spindles and many more complex parts to their Fosdick, knowing it will produce fast and easily. *Operation illustrated:* Tailstock spindle clamped to table vee. Drill, chamfer and tap 4 holes. 17/64" drill, 1020 rpm, .004 ipr, 7/8" deep. Chamfer, 1020 rpm. Tap 5/16" x 18 thread using Automatic Tapping Control (extra equipment), 240 rpm, 1/2" deep.



radial

versatile production like this

Need Drilling Equipment? Get a Proposal from Fosdick!



Radial Drills

Jig Borers

Sensitive and Upright Drills

Sensitive Radial Drills

Automatic Positioning Machines

FOSDICK

THE FOSDICK MACHINE TOOL CO., CINCINNATI 23, OHIO

Tank Maneuver on the Production Front

A military contractor in Minnesota paid an outside firm $6 per wheel just to remove worn tires from tank track wheels. An alert management saw in the Dake 150-ton hydraulic platen press an opportunity for a smart, moneysaving operation. When the press had been installed, it brought these interesting results:

- **Two operations were combined into one—pressing the old tire off the wheel, and pressing the new one on in a single move.**
- **The removal-replacement job now costs only 15 minutes of an employee's time—compared to $6 per wheel for removal only as it was handled before.**
- **It saves the time lost in sending work out—avoids delays in the supplier's shop—helps get jobs delivered on time.**

How about your production? It may very well be that a Dake Press will speed up work for you, too. Dake has a wide variety of hydraulic presses in its standard line . . . also stands ready to custom-engineer presses for jobs that standard models can't handle. It will pay you to consult your nearest Dake distributor.

Dake Engine Company, 636 Seventh St., Grand Haven, Mich.

DAKE PRESSES

Arbor Presses

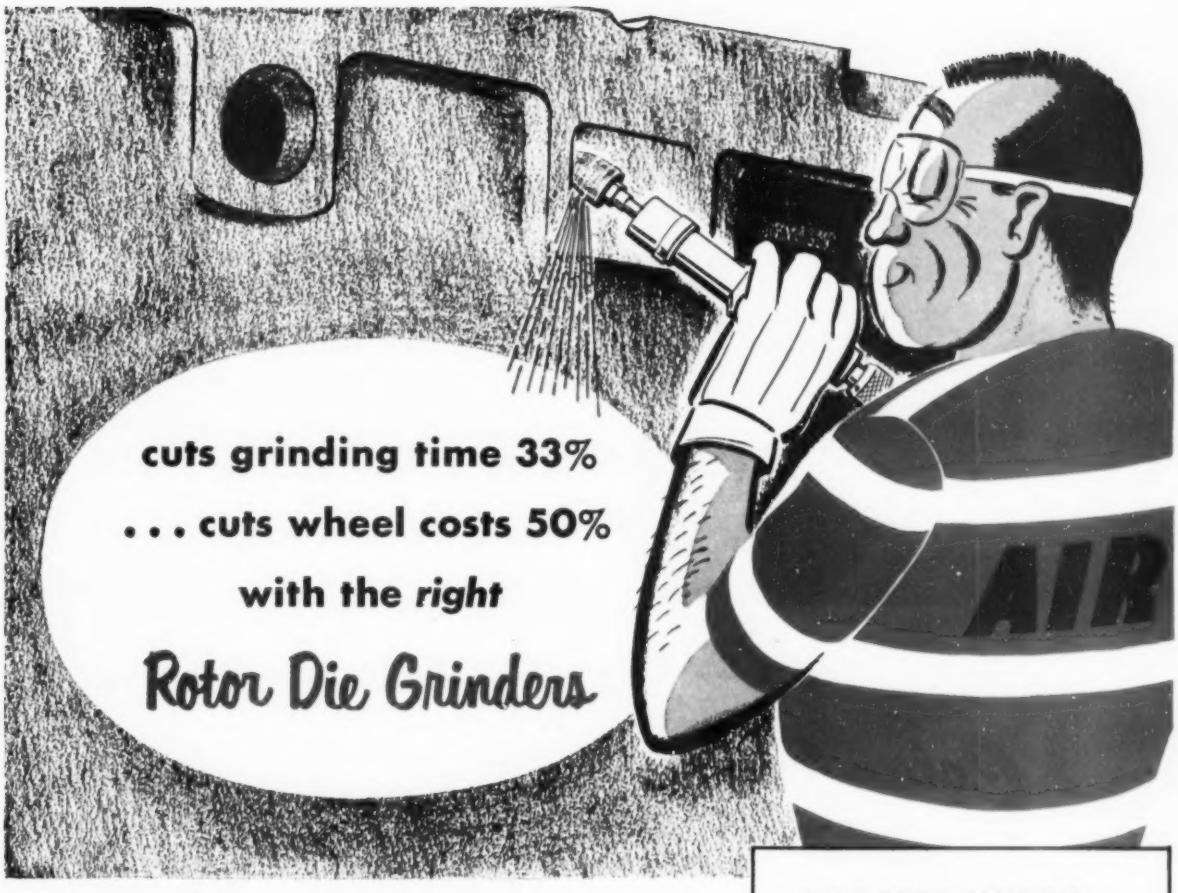
Hand-Operated Hydraulic

Power-Operated Hydraulic

Guided Platen

Gap Type Presses

Movable Frame



HERE'S how Rotor Tool engineering assistance helped a New England manufacturer of large machine tools:

PROBLEM: Getting into recesses, corners, contours in large machine tool castings of high carbon steel. Finish was important. Used large cone wheels at 6000 R.P.M. Average weight of grinders was 12 to 13 lbs. Hard to control on small contours.

SOLUTION: Rotor Application Engineer recommended Rotor M-871 Short Spindle Die Grinder at 17,000 R.P.M., using small cone wheels. Tool weight is only 4 lbs. 10 oz., permitting faster, easier handling.

RESULTS: High-speed, light-weight Rotor Grinders have cut grinding time 33%. Saves 50% in wheel costs. Cut operator fatigue.

Rotor Application Engineers can demonstrate savings on *your* job. Write for Catalog No. 38.

AIR O'TOOL

281 ROTOR MODELS...

The right grinder for your job!

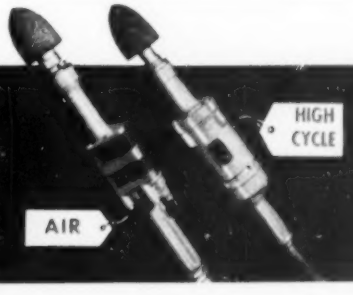
SPEEDS...21,000; 20,000; 17,000; 12,000 and 8,000 R.P.M.

COLLETS...¼"—⅛"—⅛"—½" (for abrasive sticks)

WHEEL ARBORS...For wheels ½" and ⅜" in thickness, cone wheel adapters—also extensions.

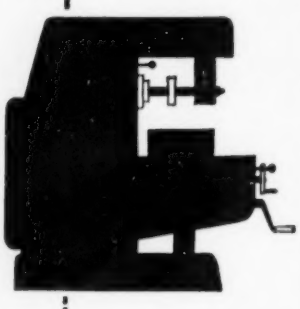
SPINDLES . . . Short and long spindles.

HANDLES...Lever, twist, snap and sleeve.



THE ROTOR TOOL CO.
CLEVELAND, OHIO

production begins with



Columbus Die-Tool

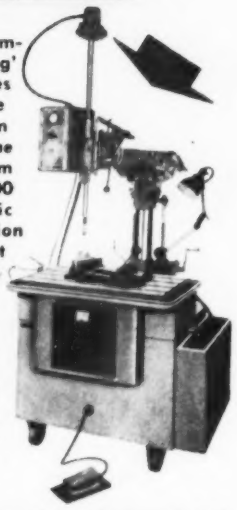
No tools like the right tools! Columbus Die-Tool designs and builds tools, jigs, fixtures and special machinery to meet your most exacting requirements. RESULTS: operating cost that matches your budget; production that matches your schedule; product quality that matches the demands of your market.

Contact Columbus Die-Tool & Machine Co. first—when you have a special machine problem. They are nationally known as expert designers and builders of special machinery and equipment . . . have been for over 46 years.

Columbus Die-Tool
AND MACHINE COMPANY
P. O. BOX 750 • COLUMBUS, OHIO
ESTABLISHED 1906
Manufacturers of
JIGS • FIXTURES • BUILDING MACHINE TOOLS COMPLETE
SPECIAL TOOLS • UNITS FOR MACHINE TOOLS

DRILL HOLES AS SMALL AS .030" IN ANY METAL OF ANY HARDNESS OR THICKNESS!

The M-300 Elox Electron Drill* combines the best in the 'arc machining' process. In addition to drilling holes as small as .030" it is adjustable for machine finishes ranging from *coarse, fine, extra fine and super fine* ...on any metals from magnesium to cemented carbide. The M-300 with exclusive Elox Automatic Feed allows for continuous operation with much of the human element removed. Using electrodes costing less than 3¢ per inch, with 'super fine' cutting, 1" of electrode will cut as much as 33" of hardened steel! Here indeed, is a dual-purpose machine that is being used for production machining of hardened steels and for removing broken drills in salvage. Write today for details and list of users.



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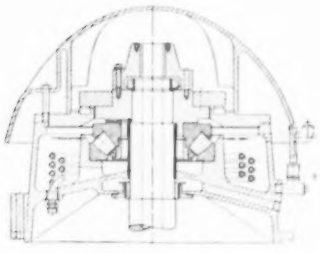

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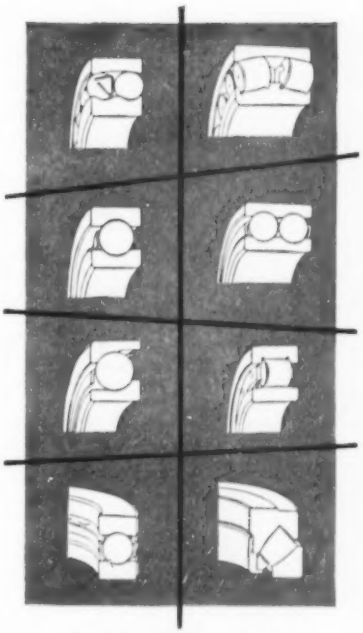

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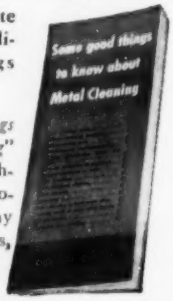

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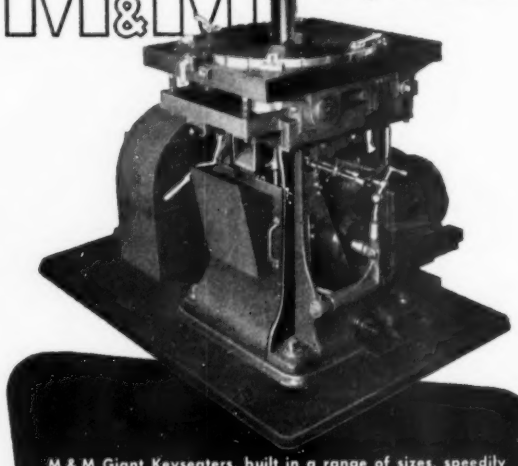

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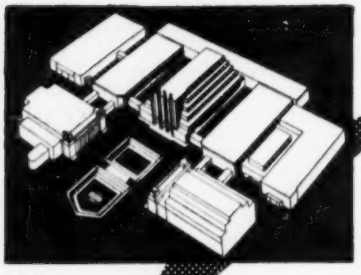

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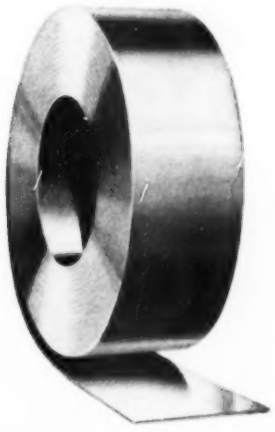

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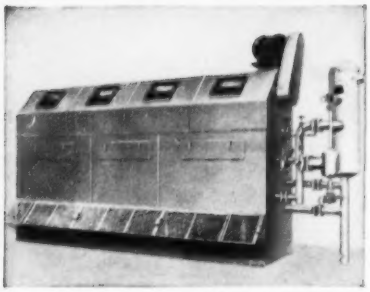

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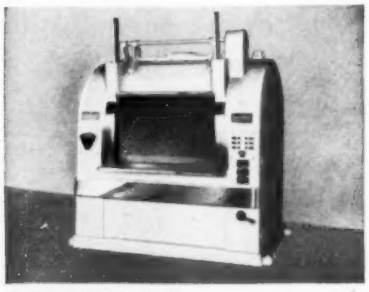

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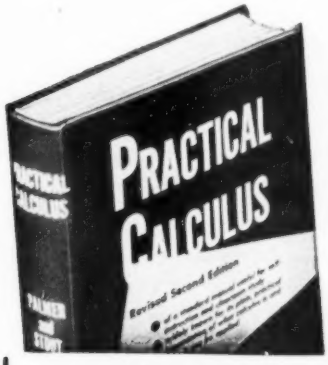

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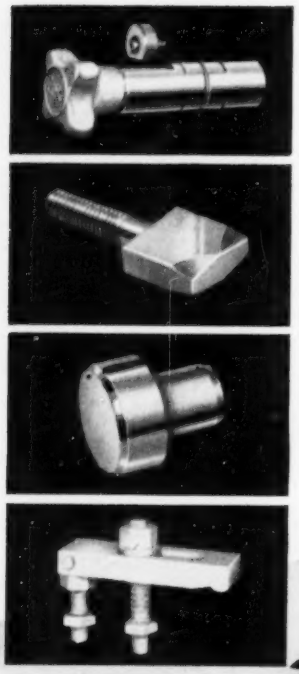

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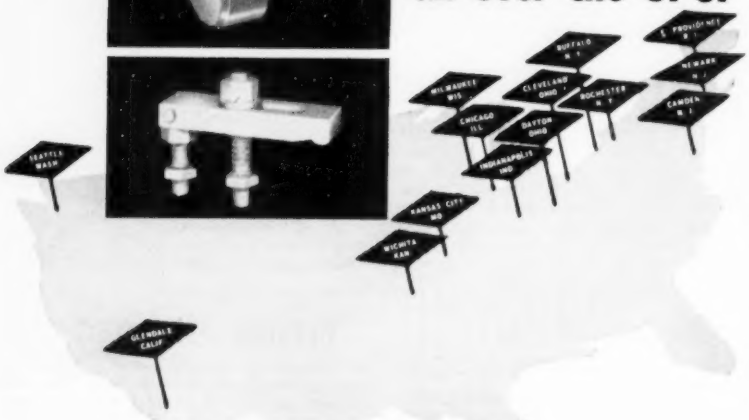

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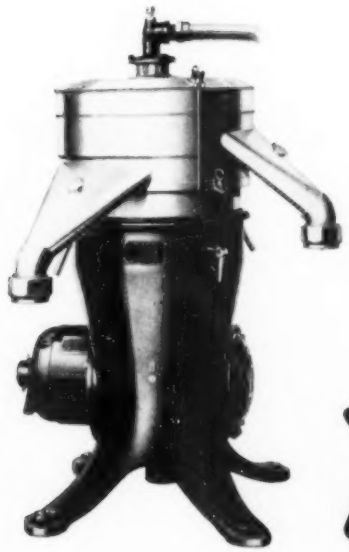

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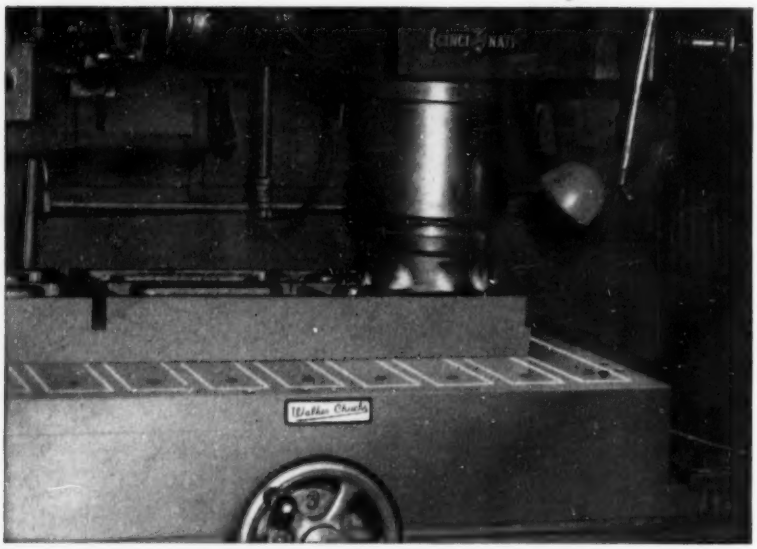

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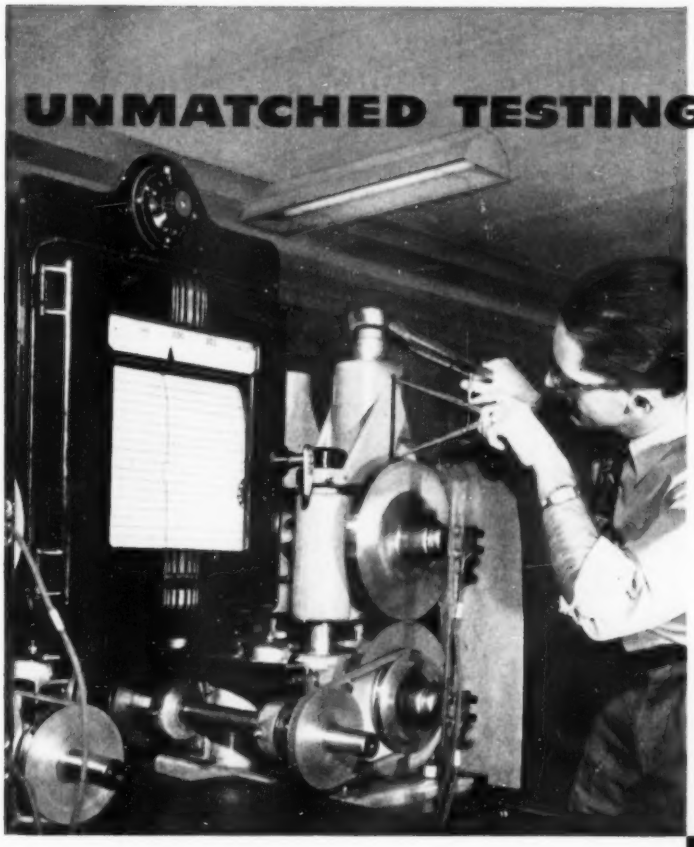

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The method of handling is simple and easy. Work to be coated is placed in a round basket and submerged in molten metal. When thoroughly heated, the basket is placed in the Barrett Centrifugal to be immediately accelerated to high speed, the excess metal being thrown off before it can cool.

A quick pick up and stop (from 2 to 3 seconds each) assures maximum production with an even thickness of coating.

Machines furnished with or without heated surrounding drum, in capacities from 40 to 240 loads per hour, handling from 5 to 100 lb. loads. When used for tinning threaded work, rethreading has been found to be unnecessary.

Barrett Centrifugals are used extensively, combine speed with convenience of operation and the utmost in safety. They are highly developed to meet all reasonable requirements, have self-contained motor drive and occupy a minimum of floor space.

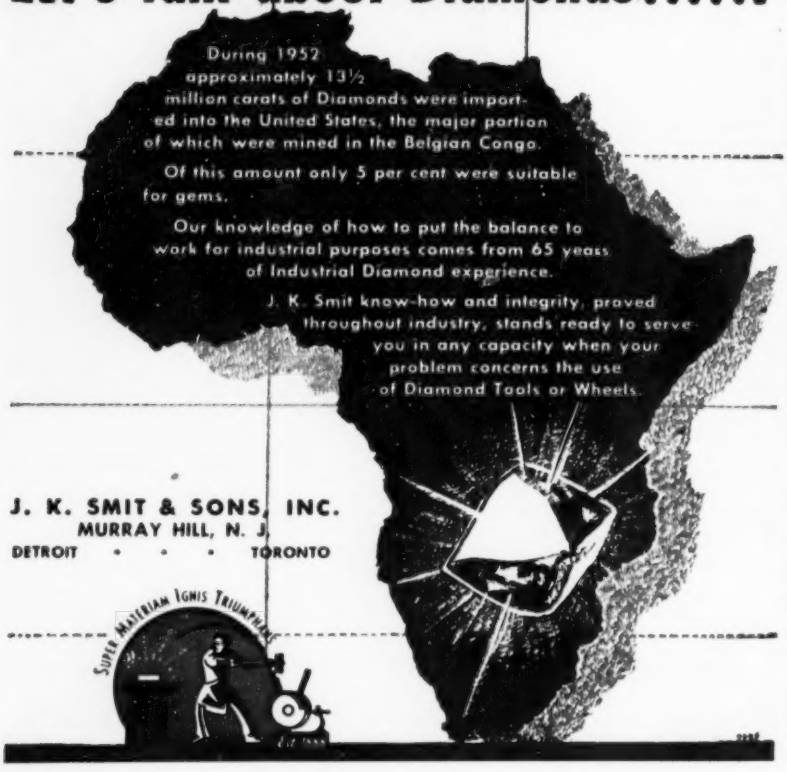
•

Send at once for full details of Barrett Centrifugal Galvanizer

THE LEON J. BARRETT COMPANY, 1800 Grafton Road, **WORCESTER, MASS.**

Designers and Builders of Centrifugal Machinery

Let's talk about Diamonds.....


During 1952 approximately 13½ million carats of Diamonds were imported into the United States, the major portion of which were mined in the Belgian Congo.
Of this amount only 5 per cent were suitable for gems.
Our knowledge of how to put the balance to work for industrial purposes comes from 65 years of Industrial Diamond experience.
J. K. Smit know-how and integrity, proved throughout industry, stands ready to serve you in any capacity when your problem concerns the use of Diamond Tools or Wheels.
SUPER MATERIAM IGNIS TRIUMPHAT

J. K. SMIT & SONS, INC.
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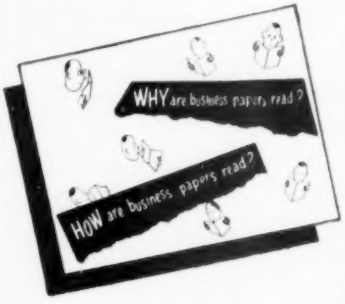
DETROIT • • • TORONTO



A copy of this quick-reading, 8-page booklet is yours for the asking. It contains many facts on the benefits derived from your business paper and tips on how to read more profitably. Write for the "WHY and HOW booklet."

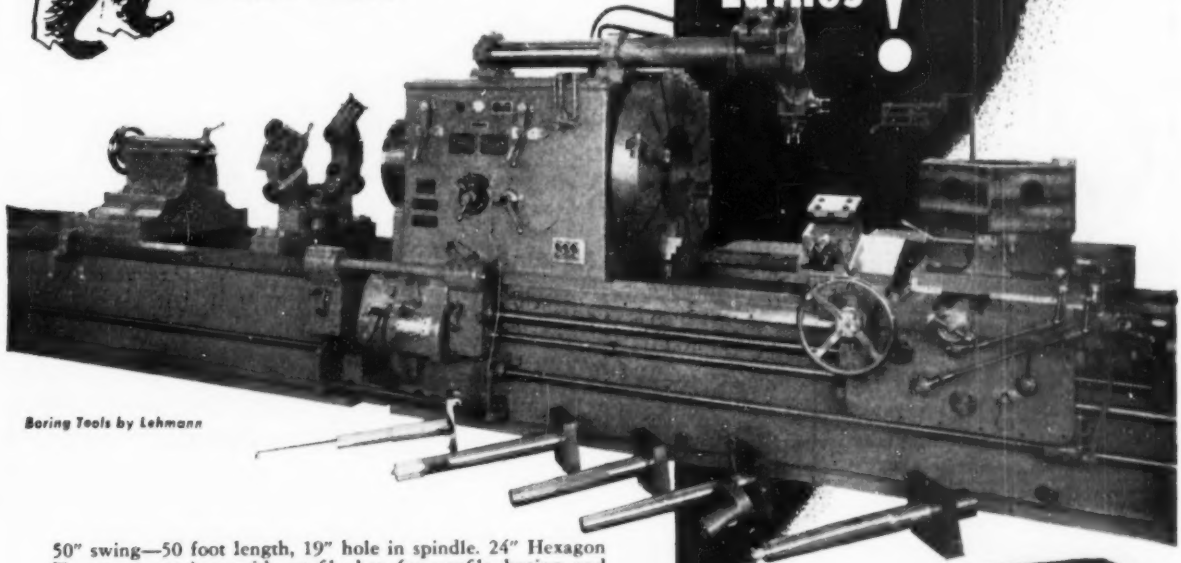
• • • • • • • • • • • • •

McGraw-Hill Publishing Company, Room 2710, 330 West 42nd St., New York 36, N. Y.

42" swing, 16 foot bed, 18" hole in spindle —Special headstock for short work piece. Semi-automatic multiple, longitudinal and cross feeds hydraulically operated on both ends of headstock.

But Boss and workers agree that you get amazing new efficiency with these

LEHMANN Large Hole DOUBLE-ENDER Hydratrol Lathes!



Boring Tools by Lehmann

50" swing—50 foot length, 19" hole in spindle. 24" Hexagon Turret on carriage with profile bar for profile boring and grinding. Retractable diamond profile wheel dresser. Weight 72,000 lbs.

Double End Hydratrol Lathes are built in sizes from 18" with holes up to 7⅛" to larger sizes with holes to suit the job. Double End operations avoid necessity for resetting the work, and insure relative concentricity of boring and turning operations and squareness of faces at both ends.

DIVISION OF NOVO ENGINE CO.

LEHMANN MACHINE COMPANY

GRAND at CHOUTEAU • ST. LOUIS 3, MO.

ANNOUNCING the NEW style SPIERTZ

INCLINABLE PRESS, TYPE Pih

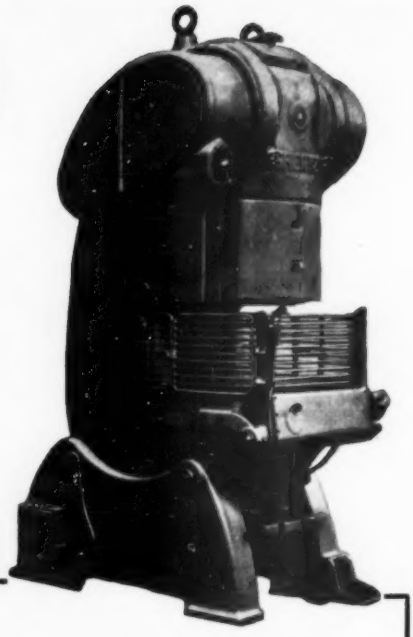
This cast steel frame type unbreakable press combines rigidity with minimum deflection. It is the result of 34 years specialized experience in the field of metal stamping. Manufactured in four standard capacities as listed in Condensed Specifications herewith.

- Gears, eccentric and crank operate in oil bath.
- Guides automatically lubricated.
- Electro-pneumatic friction clutch permits stopping press at any position of ram
- All moving parts fully protected.
- Motor driven individually, completely enclosed "V" belts transmission.
- Screen safety device closes completely before clutch engages; work accessible only after a full stop of press.
- Safety screens replaceable quickly without special tools.
- Ram adjustment for height by hand lever and only when press is not operating.
- Stroke quickly adjustable to suit job.

A lockable selector switch allows:

1) inching for tool setting
2) one stroke cycle with stop on top position
3) continuous running, "Stop" pushbutton controlled
4) stop. No way to start the press

Send for illustrated literature and complete specifications



Type	Pih 5x240	Pih 8x280	Pih 10x300	Pih 12x335
Max. Capacity Tons	50	80	100	130

SPIERTZ, S. A., Strasbourg, France

WILLEY'S TUNGSTEN CARBIDE TOOLS

Willey's—The COMPLETE LINE of cutting tools—made complete in our own factories. Hundreds of standard sizes always in stock.

SPECIAL TOOLS

Excellent service on special tools built to your specifications.

Send us your prints. You will receive prompt acknowledgement, quotation and delivery date.

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WILLEY'S CARBIDE TOOL CO.

SOLID MAKERS OF WILLEY'S METAL

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They're a MUST in every shop where many blows have to be struck without marring surfaces. Available with "SHUR-GRIP" drop forged handles.

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STAMPS, PARTS, NAME-PLATES, SIGNS, HOBS, AND MAKES MEMORIAL TABLETS.

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The ACROMARK Company

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Every Punch Press Operator *Needs* the "Safety" of a **SAFEED** Patented

PREVENTS INJURY — SAVES GLOVE COSTS

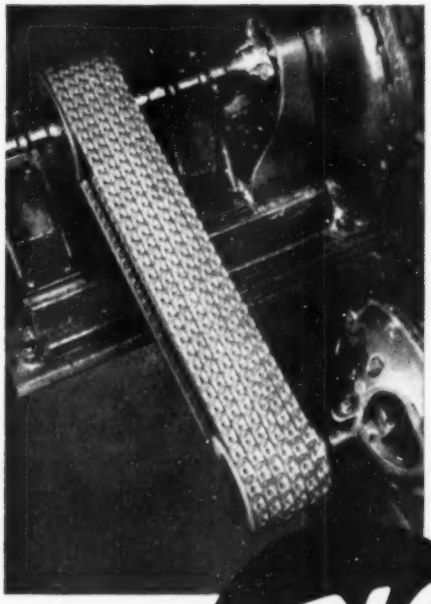
Feeds ferrous, non-ferrous strip or sheet . . . faster, safer. Use for stamping, shearing. Right or left hand non-slip fitted grip, self-adjusting. Sturdy, hardened work surfaces. FULLY GUARANTEED.

Write today
Early delivery.

AFFILIATED MACHINE & TOOL CO.

260 WEST ST., NEW YORK 13, N. Y. CAnal 6-4937

"Yes, but what will it do for me?"



We'll answer your question by giving you a run-down of what we call the three "E's" of Veelos, the adjustable v-belt . . .

Ease of Installation—the link construction of Veelos makes it easy to install without re-setting the motor or tearing down outboard bearings. In many cases installation is completed in 50% to 90% *less time* than it would take to make an endless v-belt installation.

Efficiency of Operation—because individual Veelos v-belts can be adjusted for correct tension, matched sets can be kept matched; vibrationless, full power delivery is assured.

Economy of Inventory—just 4 reels of Veelos in the 0, A, B and C widths can replace up to 316 different sizes of endless v-belts. Of course, if your machines use only one or two widths of v-belt, you stock only those widths of Veelos. Inventory is simplified, costly belt deterioration is eliminated and you save valuable stockroom storage space.

Put these three "E's" of Veelos to the test in your plant, under your own operating conditions, and you'll find the answer to your question . . . standardize on Veelos and *save!*

VEELOS
THE LINK
V-BELT

VEELOS DATA BOOK—Here's the complete story on Veelos, the adjustable v-belt. Book gives detailed engineering data, is fully illustrated. Write for your copy today!

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ADJUSTABLE TO ANY LENGTH • ADAPTABLE TO ANY DRIVE

FILLING AN ORDER BY AUTOMATIC SPINNING. Automatic machines, developed by Teiner, permit precision spinning to reduce costs on long-run items. Example of the all-gauge — all-metal — any-quantity — spinning capacity available at Teiner. ***Write for color Brochure 52A.***

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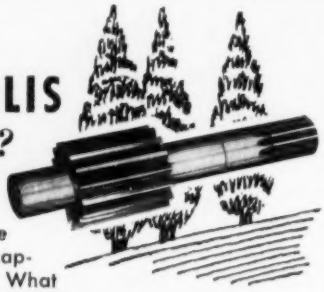
what does
THUJA OCCIDENTALIS
have to do with gears?



Thuja occidentalis is a type of cedar tree —of which there are many in the landscaping around our modern, attractive plant. What do they have to do with making gears? Indirectly, a lot; because they contribute a lot to making our plant a desirable and attractive place for our expert craftsmen to work. Pleasant surroundings, we believe, are of major importance in helping our employees produce the highest quality work they are capable of. Thus our Thuja occidentalis is one of the many details we've considered in our efforts to bring you better custom gears. If you're not already a Cincinnati Gear customer, inquire today for full information.

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WORM
INTERNAL
SPIRAL BEVEL
HELICAL
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*CONIFLEX BEVEL
SPLINE SHAFT
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THE CINCINNATI GEAR COMPANY
"Gears . . . Good Gears Only"
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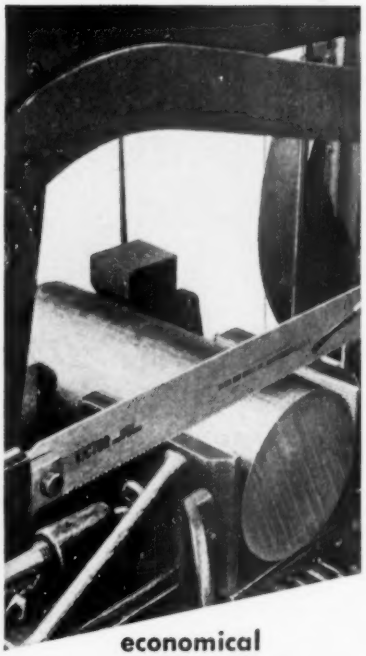

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VICTOR "Moly"® HIGH SPEED Power BLADES

Whatever your metal cutting problem, VICTOR "Moly"® High Speed Power Blades will cut your initial blade cost 15%, and give you the additional economy of more efficient cutting.

Quality makes VICTOR Blades industry's preference—top-quality, carefully heat-treated steel, fabricated on specially designed equipment, to give you fast, economical cutting and long blade life. Send for the free VICTOR Metal Cutting Booklet which tells you how to pick 'em—Gold "Moly"® High Speed or Silver Unbreakable High Speed.

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from your
VICTOR DISTRIBUTOR

VICTOR "Moly"® High Speed Power Blades are always sold through the recognized Industrial Distributor because he is closest to your problems. You know and have confidence in him, and he can give you delivery from stock where and when you want it.

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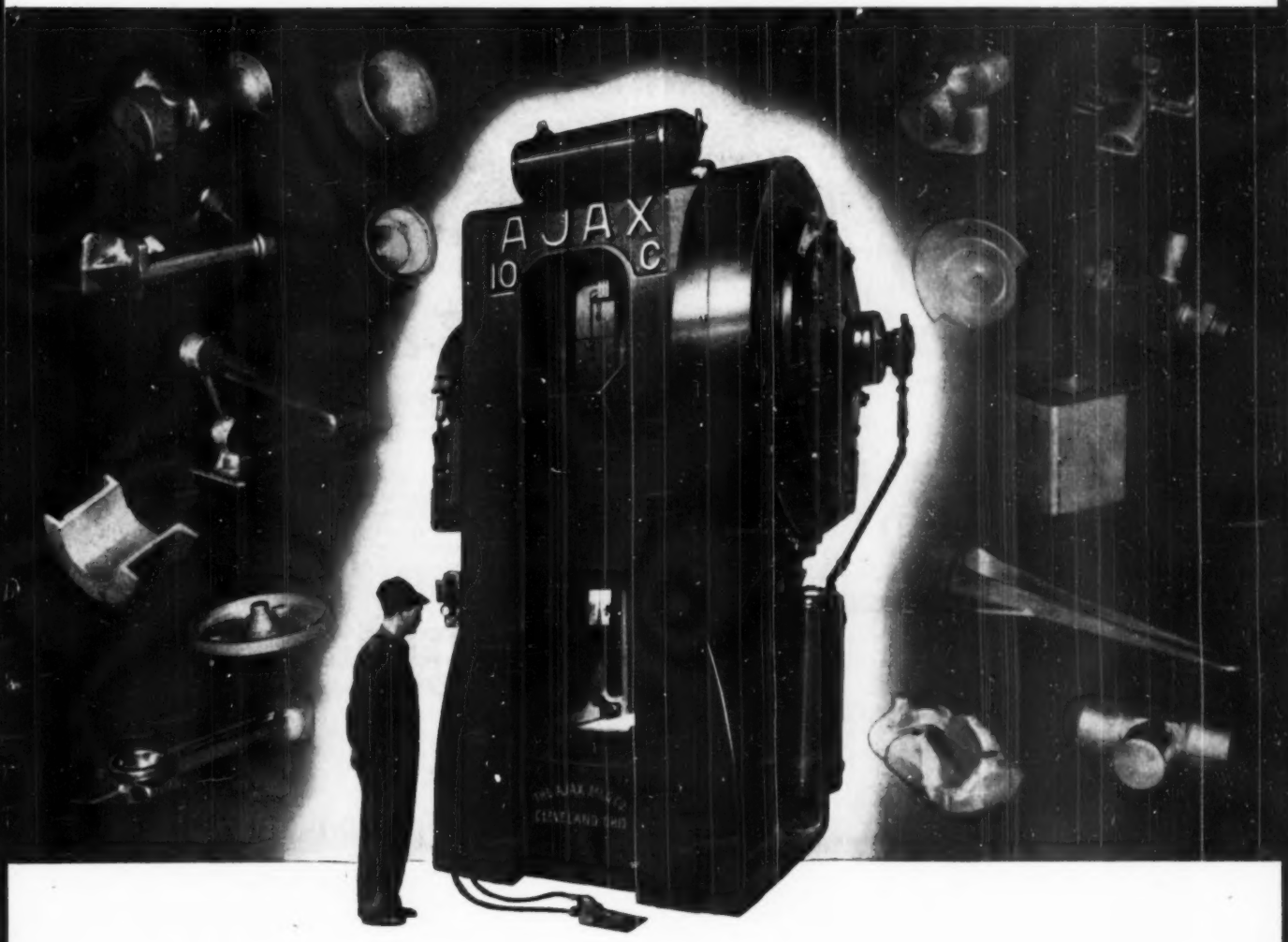
SAW WORKS, INC. • MIDDLETOWN, N. Y., U.S.A.
Makers of Hand and Power Hack Saw Blades, Frames and Metal Cutting Band Saw Blades

AJAX *High Speed* Forging Presses



MORE ACCURATE FORGINGS at HIGH PRODUCTION SPEEDS

AJAX PRESSES are built in a wide range of sizes

FIVE HUNDRED TO EIGHT THOUSAND TONS CAPACITY

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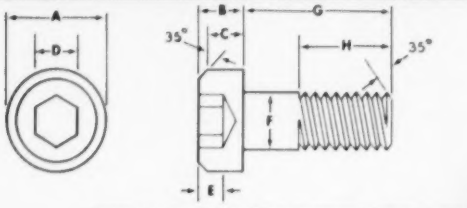
DESIGN ENGINEERING at YOUR Service..



MAC-IT PARTS COMPANY							
MATERIAL SAE 8740 STEEL ALLOY ROCKWELL							
FINISH CHROMIUM PLATING ON STEEL C.M.&S.C.							
TOLERANCE IN LENGTH THE TOLERANCE IN LENGTH							
A	B	C	D	E	F	G	H
3/16	249	229	185	127	298	3/8	3/8

FASTENER DESIGN

Mac-it socket-head screws, providing strength without bulk, give lighter weight, streamlining, and more secure fastening to equipment you design. Whether the design problem involves standard or special screws, Mac-it will add to the appearance, efficiency and performance of the equipment. Use Mac-it Fastener Engineering Service for all problems involving screws for any type application

MAC-IT PRECISION

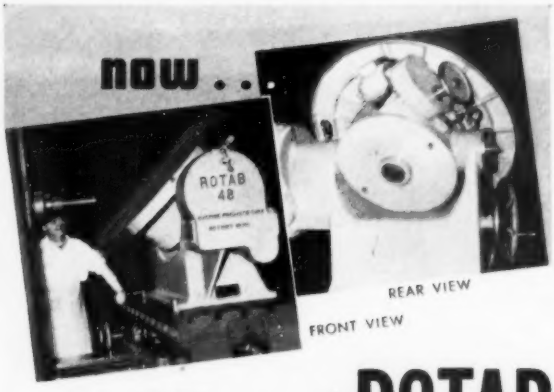
The precision manufacture and quality control used in making Mac-it Screws provide users with high dimensional accuracy and uniformity. All Mac-it Screws in both coarse and fine threads are held to a class-3 fit. Mac-it maintains a Fastener Engineering Service for the design, development and production of screws for all types of applications.

DISTRIBUTOR SERVICE

Hundreds of Mac-it distributors from coast to coast are ready to render immediate service in supplying your requirements for standard or special screw products.

MAC-IT SCREW DEPARTMENT
STRONG, CARLISLE & HAMMOND COMPANY
1392 W. 3RD. STREET · CLEVELAND 13, OHIO
Manufactured by Mac-it Parts Co., Lancaster, Pa.

Contact your nearest Mac-it distributor or the Home Office, Cleveland, Ohio, for the Mac-it Catalog No. 49 which contains full technical data.



A 48-inch ROTAB

with motor-driven table for fast and easy positioning of work

Now a giant ROTAB!—to give you an extra sized table (48-inch) with benefit of motor-drive to position work fast and easily. The table, with 8 tee slots for clamping work, can be rotated by push of button, and locked to any degree to precision accuracy within 2 min. by vernier graduations. Can also be set from vertical to 30° below horizontal the opposite way. Has one shot lubrication.

● The 36-inch model also available with motor drive. Smaller models—12" and 24"—are set manually.

MACHINE PRODUCTS CORPORATION
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Expect your

1954 PRODUCTION PLANBOOK for Metalworking in Mid-November

Watch for all the details!

AMERICAN MACHINIST
330 West 42nd Street, New York 36, N. Y.

STRAIGHT SIDE SINGLE CRANK PRESSES for heavy blanking and forming

Heavier classes of blanking and forming work can be handled efficiently and economically on these presses.

Sturdily constructed with either solid frame or built up with tie rods. Small elastic deflections do not affect tool alignment. All stresses taken centrally. Made also with wedge adjustment for slide for very close work.

Full details on request.

ZEH & HAHNEMANN CO.
NEWARK N. J.
180 Vanderpool Street

Communist machine-gun fire dropped him in combat. But whole blood kept him alive, saw him through the hospital. He thanks you for his life.

She'd been exposed to polio. A new serum, Gamma Globulin, made from blood, helped ward off the dread disease. She thanks you for her life.

A tornado whipped suddenly across her home town. She was badly injured by falling debris. But a quick operation, several transfusions pulled her through. She thanks you for her life.

Three grateful people say: "we're HERE... because you were THERE!"

Each one of these people is alive today because someone gave blood.

If you've given blood before, you know how easy it is—how quick and painless. And you know what a wonderful feeling it is when you realize that what you've done may give another person his life.

Now you are asked to give blood . . . again and again. And you can do it safely every 3 months.

Because America's need for blood has increased enormously—for our armed forces, for accident and disaster victims at home, for new disease-fighting serums.

Many a life hangs in the balance! Will you help? Call your Red Cross, Armed Forces or Community Blood Donor Center today!

BUSINESS EXECUTIVES
CHECK THESE QUESTIONS

If you can answer "yes" to most of them, you—and your company—are doing a needed job for the National Blood Program.

- ◯ HAVE YOU GIVEN YOUR EMPLOYEES TIME OFF TO MAKE BLOOD DONATIONS?
- ◯ HAS YOUR MANAGEMENT ENDORSED THE LOCAL BLOOD DONOR PROGRAM?
- ◯ HAS YOUR COMPANY GIVEN ANY RECOGNITION TO DONORS?
- ◯ HAVE YOU INFORMED EMPLOYEES OF YOUR COMPANY'S PLAN OF CO-OPERATION?
- ◯ DO YOU HAVE A BLOOD DONOR HONOR ROLL IN YOUR COMPANY?
- ◯ WAS THIS INFORMATION GIVEN THROUGH PLANT BULLETIN OR HOUSE MAGAZINE?
- ◯ HAVE YOU ARRANGED TO HAVE A BLOODMOBILE MAKE REGULAR VISITS?
- ◯ HAVE YOU CONDUCTED A DONOR PLEDGE CAMPAIGN IN YOUR COMPANY?
- ◯ HAVE YOU SET UP A LIST OF VOLUNTEERS SO THAT EFFICIENT PLANS CAN BE MADE FOR SCHEDULING DONORS?

Remember, as long as a **single** pint of blood may mean the difference between life and death for **any** American . . the need for blood is **urgent!**

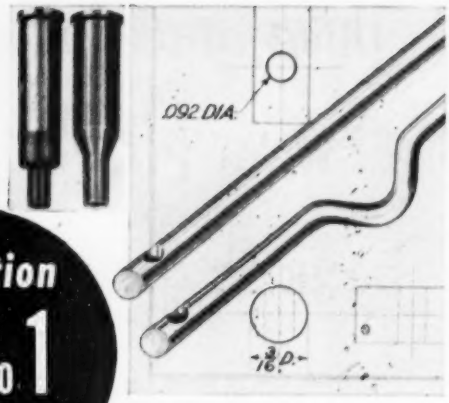
NATIONAL BLOOD PROGRAM

GIVE BLOOD

...give it again and again

pivot

HIGH SPEED STEEL
STRAIGHTGROUND
WHIPSLEEVED
PUNCHES



increase production 70 to 1
EXCEEDING 2 to 1 RATIO

AT GEMCO MANUFACTURING CO. SOUTHINGTON, CONN.

Mr. Gerard J. Mauro, President of Gemco Manufacturing Company, Metal Stampings and Wire Forms, says: "We are perforating C.R.S. Basic wire, 3/16 diameter, with straightground whipsleeved Pivot Punches of .092 point diameter. Although this exceeds a 2-to-1 ratio we are getting runs of 35,000. Our own punches achieved runs of only 400 to 500."

"The Pivot Punches have never broken and have held their size through 6 grinds. This has resulted in three-way savings: (1) The price of the punches is actually less than our own cost to manufacture; (2) The economy of a 70-to-1 increase in production; (3) A tremendous savings in maintenance costs."

Get the short story on longer punch life, greater accuracy and punching power, higher production through Pivot Punches, *more economical than your own cost to manufacture*. Send for catalog and Standard prices. Write Dept. AM.

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pivot punch and die corp.
NORTH TONAWANDA, N. Y.

McGRAW-HILL

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Whether you need an instruction book or service manual to accompany your equipment written to government specifications . . . or product catalogs . . . or training booklets . . . or industrial literature . . . our writing staff can do the job for you. It will do the research, planning, writing, and organizing to satisfy your requirements.

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For government publications or industrial literature, our Art department can meet your specifications, or those of the government agency, for isometrics, exploded views, cutaway views, retouched halftone copy, rendering, lettering, or any other type of art work. It can design to standardized format or present industrial visuals of compelling appeal.

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Our printing, binding, and paper resources are among the best in the country. Every type of reproduction is available . . . offset, letterpress, multigraph, or even mimeograph. We can handle a complete printing job or, in the case of offset, furnish repro copy when other facilities must be used.

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Represented nationally in principal cities.

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Minneapolis 7, Minnesota

In November, you'll receive, as part of your regular subscription to *American Machinist*, the

1954 PRODUCTION PLANBOOK for Metalworking

Details on the *PLANBOOK* soon.

American Machinist
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SUPERVISORY POSITION

WANTED: Man throughly qualified to supervise grinding equipment in machine shop including Reishauer Gear Grinders. Must be able to set up and operate all types of grinders in addition to supervise. Steady peace-time position. Write stating age, education, experience, and references. Modern northern New Jersey plant.

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For several territories by manufacturer of outstanding

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Soluble and non-soluble Special quality approved by many of the largest users. Liberal commission. No objection to non-conflicting products. Representative of tool products, particularly invited. Bright future. Please state experience.

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To have tool and die shop background. For plant under 35, manufacturing name plates, badges and marking products.

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SALARY START TO $9600

Good exp. in tooling—machining operations with major mfr. Further Oppor.

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SAN FRANCISCO: 68 Post St. (4)

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POSITION WANTED

MAN WITH 30 years experience in machine and structural shops as Supt. and General Foreman would like to contact growing and progressive concern who can use a Trouble Shooter, Expeditor inspector, or Production or quality control man. PW-8262, American Machinist.

8888 FOR YOU 8888

We Pay Liberal Commissions For All Leads On Contacts Pertaining To

TOOL DESIGN

Processing or special machine design. We are an established firm doing work for many nationally known Corporations.

ENGINEERING SERVICE CO.
415 No. Dearborn St., WH 3-0823, Chicago 10, Ill.

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(Classified Advertising)

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$1.50 per line, minimum 3 lines. To figure advance payment count 5 average words as a line.

Position Wanted and Individual Selling Opportunity Wanted advertising rates are ½ the above rate payable in advance.

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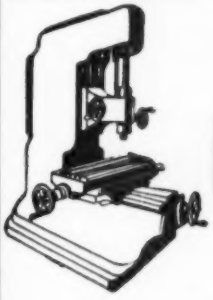
The advertising rate is $12.60 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

An advertising inch is measured ⅞" vertically on a column—3 columns—30 inches to a page.



SEARCHLIGHT
Equipment Spotting
SERVICE

This service is aimed at helping you, the reader of AMERICAN MACHINIST, locate used and surplus new metalworking machinery and equipment not currently advertised. (This service is for user-buyers only.)

Just send in the specifications of the equipment wanted on the coupon below, or on your own company letterhead, to

Searchlight Equipment Spotting Service
c/o American Machinist
330 W. 42nd St., N.Y. 36, N.Y.

Your requirements will be brought promptly to the attention of the used equipment dealers advertising in this issue. You will receive replies directly from them.

NO CHARGE • NO OBLIGATION

Searchlight Equipment Spotting Service
c/o American Machinist
330 W. 42nd St., New York 36, N. Y.

Please help us locate the following used equipment:

NAME ..... TITLE .....

COMPANY .....

STREET .....

CITY ..... ZONE ..... STATE .....

7/6/53

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Grinding Specialists at your Service

BLANCHARD
Up to 84" Diam.

PLANE SURFACE
Thomson 36" x 120"

DOUBLE DISC
All Shapes — All Materials

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Infeed — Thruffed Shoulder and Bar

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Up to 16" x 80"

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FLAT LAPPING
Flat Lapping — Up to 10 Inches
Surface Finishes — From 1 to 5 Rms or Less
and Flatness Accuracy to Millionths of an Inch
ALL SHAPES — ALL MATERIALS
Closest Tolerances - Fine Finishes - Perfect Flatness
Low Prices — On Time Deliveries

LAFAYETTE GRINDING CORP.
117 Banker St., Brooklyn 22, N. Y. EVergreen 8-5973

CAN YOU USE HELP ON PRODUCTION TURNING?

Manufacturer has open time available in chucking department, on automatic turret lathes and eight spindle Bullard mult-au-matics.

Send prints for estimates or comparison on present costs.

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330 W. 42nd St., New York 36, N. Y.

10 to 12 ft. Lengths
ALL METALS
Also special screw machine products to order
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MACHINE SCREW
20-40 Barclay St.
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Makers of
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$1.00 EA., SAME DAY SERVICE
Mfgr's. Of A Complete Line
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WE ARE INTERESTED IN PURCHASING

good used Goss and Delcuw 6" threading type 4 spindle tool rotating automatic chucking machine and lead screw. Also Reeds thread roller serial #A-21-63.

This equipment must be in A-1 condition.

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Air Tools - Routers
Complete Plants
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Anything you want

that other readers of this publication can supply

OR —

Something you don't want

that other readers can use advertise it in the

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● We are now equipped with the latest type of punch making machines. Prompt service given on all orders. Size limit is 4½"x5½" in height with no limit as to shape. Send your drawings for quotations. We furnish any available die steel as per your specifications—or you may furnish the blank. All work guaranteed according to your drawings.

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AUTOMATIC #0 B & S Wire Feed Screw, Late.
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AUTOMATIC, 2G Brown & Sharpe, Motor Driven.

BALANCER, Anderson Bros. 14"x64", Roto-Checker.
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BORING MILL, 36" Bullard M.D., V.T.L.
BORING MILL, 2¼" Lucas Horiz., M.D.
BORING MILL, Lucas Horiz. 3" Bar, M.D.
BORING MILL, Giddings & L #8 Horiz. 3¼" Bar.
BORING MILL, 100" Niles Bement Pond, M.D. 2 swivel hds.
BARRELS, Tumbling Lupomatic, Schutte & Koetring.
BRAKE, #335 Chicago, M.D., Press, 6' 15 ga., NEW.
BRAKE, #185 Chicago Power Apron, 8'x3/16" cap.

COMPRESSOR, Ingersoll Rand ER-1, 10 HP, M.D.
COMP., 15 HP, 10 HP, Gardner Denver, M.D., New.
COMPRESSOR, C-P 50 HP, M.D., 10x10, 278 CFM.
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CRANE, Canton #8 Portable Goosenock 3 ton cap.
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RADIAL DRILL, 3' 9" Mueller, M.D.
RADIAL DRILL, 4'x11" American, M.D.
RADIAL DRILL, 5'13" Cincinnati-Bickford, M.D.
RADIAL DRILL, 6'x15" Cincinnati-Bickford, M.D.
RADIAL DRILL, 30" Walker Turner M.D., Late.
DRILL, Fosdick 16", S.S. Power Feed, M.D.
DRILL, #2 Colburn H.D. #4 M.T., M.D.
DRILL, #121 Baker Auto. S.S. Cam Operated.
DRILL, Deep Hole, Avey-Draulic #2, M.D.
DRILL, Edlund #2B, 3 spdle. #2 M.T., 16".
DRILL, 4 & 6 Sp. Avey 12" overhang, #3 M.T., M.D.
DRILL, 4 Sp. Barnes H.D., M.D. #4 M.T., P.F.
DRILL, Cincinnati 21" with Tapping Attach. M.D.
DRILL, Natco Multiple Spdle. #12, #1 M.T., M.D.
DRILL PRESSES, Leland Gifford #1MS, 1, 2, 3, 4.
DRILL PRESS, #2MS Buffalo Forge single spindle.
DRILL, Barnes, 24" S.S. #4 M.T., 1½" cap.
DRILL PRESS, #25 Foote-Burt S.S. 24", #5 M.T.
DRILLS, #14, #15, #16, #18 Buffalo Forge, M.D.
DEEPFREEZE Motor Products 40 below zero.
DEMAGNETIZER, SB-911 Magnaflux, late type.

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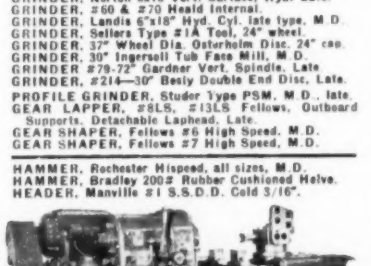
FILER, #11-S Cushman Bly Auto Saw Filer.
FILER, Type P4, Oliver Floor Type, M.D.
FURNACE, Westinghouse Elec. 18 KW. 2100° F. cap.

GRINDER, M.D. Sanford Surf. 8"x12" cap., New.
GRINDER, #1 Wilmarth Morman Hand Surf., 6"x12".
GRINDER, #2 Imperia Univ. Tool & Cutter, New.
GRINDER, #2 Brown & Sharpe Sur. 6"x18" cap., M.D.
GRINDER, 6"x18" Thompson "F" Hyd., Late.
GRINDER, #4 G & L Univ. Tool & Cutter, M.D.
GRINDER, Disc, Besly #205, 18" Dble End.
GRINDER, Heald Rotary #25, M.D. 16" Cap.
GRINDER, Cylindrical, Norton 10"x24", M.D.
GRINDER, Brown & Sharpe #4 Univ. 12"x60".
GRINDER, Thread, Jones & Lamson #TG-615, Late.
GRINDER, Heald #72A-3 Internal Size-Matic.
GRINDER, 14"x36" Pratt & Whitney Vert. Surf.
GRINDER, Pratt & Whitney 22"x84" Vert. Surface.
GRINDER, Greenfield #12 Int. Hydromatic, M.D.
GRINDER, Oliver Auto. M.D. Drillpointer, #510.
GRINDER, #33 Abrasive Vert. Auto. Surface, M.D.
GRINDER, #22 Heald Horiz. Rotary Surface, M.D.
GRINDER, Diamond Snagging 10 HP, 24"x4¼".
GRINDER, Norton 6x18 Vert. Surface, Hyd. Late.
GRINDER, #60 & #70 Heald Internal.
GRINDER, Landis 6"x18" Hyd. Cyl. late type, M.D.
GRINDER, Sellers Type #1A Tool, 24" wheel.
GRINDER, 37" Wheel Dia. Osterholm Disc, 24" cap.
GRINDER, 30" Ingersoll Tub Face Mill, M.D.
GRINDER, #79-72" Gardner Vert. Spindle, Late.
GRINDER, #214—30" Besly Double End Disc, Late.
PROFILE GRINDER, Studer Type PSM, M.D., late.
GEAR LAPPER, #8LS, #13LS Fellows, Outboard Supports, Detachable Laphead, Late.
GEAR SHAPER, Fellows #6 High Speed, M.D.
GEAR SHAPER, Fellows #7 High Speed, M.D.

HAMMER, Rochester Hispeed, all sizes, M.D.
HAMMER, Bradley 200# Rubber Cushioned Helve.
HEADER, Manville #1 S.S.D.D. Cold 3/16".

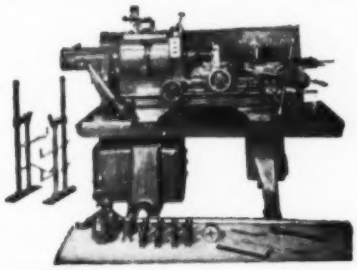


4DE POTTER & JOHNSTON Automatic Turret Lathe, Motor Driven, T.E.F.C. 7½ HP. 3/60.220/440.

INDUCTION HEATER, 16 KVA Ecco Hi Frequency.
INDUCTION HEATER, 30 KW Lesel, Late Type.
AIR MOTOR HOIST, Ingersoll Rand 2000# cap.
ELECTRIC HOISTS, 500-4000 lbs. Whiting, NEW
HONE, #194 Barnes Vertical, M.D., Hyd. Late.

KEYSEATER, #5 Mitts & Merrill, Giant, M.D.
LAPPER, 2F Norton Vert., M.D., late type.

No. 7 BARDONS & OLIVER Geared Head
Full Universal Turret Lathe, Preselector Head, Bar Feed, 4" capacity through spindle, Late Type, Motor Driven.

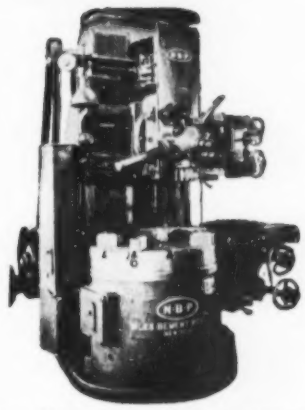


#2 WARNER & SWASEY Geared Head Turret Lathe, 12 Spindle Speeds, Bar Feed.

LATHE, Lo-Swing 8"x108", M.D., A.C. Rebuilt.
LATHE, Porter-Cable 9"x15" Geared Head Prod.
LATHE, #6 WSL Reid Smallpiece Prod., Late Type.
LATHE, Hendey 12"x5' Q.C.G. Taper Attach. M.D.
LATHE, LeBlond 14"x6', Q.C.G., M.D.
LATHE, Hendey 14"x8' Q.C.G. Taper Attach. M.D.
LATHE, American 16"x6' Q.C.G., Grd. Hd. M.D.
LATHE, Lehman 18"x7' Q.C.G., M.D.
LATHE, American 18"x10' Q.C.G., Grd. Hd.
LATHE, South Bend 18/28"x8' Gap Bed, Q.C.G. M.D.
LATHE, Reed-Prentice 20"x10' Grd. Hd. M.D.
LATHE, LeBlond 22"x10' Q.C.G., M.D.
LATHE, 24"x12' Boye & Emmes Grd. Hd., T.A., Late.
LATHE, Putnam 23/32"x12' Q.C.G., M.D.
LATHE, LeBlond 24"x14' Q.C.G., Grd. Hd.
LATHE, Lodge & Shipley 26"x14', Q.C.G., M.D.
LATHE, Bridgeford 27"x12' Geared Head, M.D.
LATHE, 27"x16' Niles Timesaver, Grd. Hd., M.D.
LATHE, Bridgeford 32"x16' Q.C.G., Grd. Hd.
LATHE, 42"x18' Pittsburgh Geared Head, M.D.
LATHE, Bufing Dble. End #VMT5, Devine Bros.
LATHE, Turret #1 Bardons & Oliver Electric Head.
LATHE, Turret, #2 Simmons Vari-Drive 220 V.
LATHE, Turret #2 W & S Univ. Grd. Hd., Late.
LATHE, Turret, #4 Warner & Swasey Univ. 1½".
LATHE, Turret #6 Warner & Swasey Grd. Hd. Ram Type, Bar Feed, Motor in base.
LATHE, Turret #2 Cincl. Acme Univ. Geared Head.
LATHE, Turret, #3A Warner & Swasey Univ. M.D.
LIFT TRUCKS, Baker 1 & 2 ton, Platform & Fork.

MILL, No. 1 U. S. Hand Mill, M.D. Late.
MILL, #4 Burke Motor Driven, Late, M.D.
MILL, #2 Pratt & Whitney Prod. Duplex, M.D.
MILL, #3VB Hardinge Vert. Bench, M.D.
MILL, #4B Brown & Sharpe H.D., Horiz. M.D.
MILL, #14 Garvin Plain Horiz., M.D.
MILL, #0Y Brown & Sharpe Plain Horiz., M.D.
MILLING MACHINE, #2B K & T Horiz., M.D.
MILL, Cincl. Horiz. #3, #4, #5 High Power, M.D.
MILL, #1 Brown & Sharpe Plain Horiz., M.D.
MILL, #0-B Cincl. Vert. Prod. Late, M.D.
MULT-MILLER, U.S. Tool #MM-1-6 Auto. Prod.
MILL, #0 Douglas Plain Horiz. M.D., Coolant.
MILL, #0 Sundstrand Rigidmil Hyd. Late Type.
MILL, #0 Vernon Hand Mill, M.D., Late.
MILL, 2A Brown & Sharpe Horiz. Univ., M.D.
MILL, #2SP Van Norman Horiz. M.D., Late.
MILLING MACHINE, Kempsmith #2 Horiz. Univ.
MILL, #3 Cinc. Univ. Horiz., M.D.
MILLING MACHINE, LeBlond #4 Horiz. Univ.
MILL, #2 Vert. M.D. Brown & Sharpe.
MILL, #3 Cincl. Vertical Hi Power, M.D.
MILL, #5C Bickner Vert. Die Sinker, M.D.
MILL, 42"x36"x12' Ingersoll Planer Type, 4 hds.
MILLING MACHINE, #2 Van Norman Duplex, M.D.
MOTOR GENERATOR SET, Gen. Electric, 100 K.W.
NIBBLER, #116 Savage 36"x3/16" Cap., M.D.
NAILING MACHINE, No. 16—48"-54" Morgan, Late.

THREADING, Staybolt Lassiter Millholland 1½".
THREAD MILL, 7½x11 Hansen-Whitney, Univ.
THREAD MILL, 6x14 Pratt & Whitney No. 1105
THREAD MILLER, Plan-O-Mill #3 Planetary Form & Thread Semi-Automatic Milling Machine, Late.



36" x 44" Niles Vertical Boring Mill, Side Head, Motor Driven.

#40A Lees-Bradner Automatic Checking Thread Mill. Motor Driven, Late Type.

PAPER SHREDDER, No. 10 Mits & Merrill, M.D.
PLANER, Cincinnati 30"x30"x12' A.C., M.D.
POWER PRESS, Bliss #164 Open Back, M.D.
POWER PRESS, Bliss #3A S.S. Dble. Crank Grd. 45 tons, 4" stroke, 30"x26" Bed Area, M.D.
POWER PRESS—Bliss-Consolidated #163-B Straight Side Dble. Crank 45 tons, M.D.
PRESS, #2½ & #6 Toldo, OBI, Motor Driven
PRESS, D72 & DG73 Ferracute, Redraw, M.D.
PRESS, #5 Johnson OBI, 56 tons, new.
PRESS, #7 & #8 Johnson OBI 70 & 90 tons, New.
PRESS, 135 Ton Clearing Single Crank 8" Str., Late.
PRESS, 70H & 125PA Drake Hyd. Arbor, New.
PRESS, Federal #2 O.B.I., Grd. 2" Stks.
PRESS, Bliss #18, #19, #20, #21, OBI, A.C., M.D.
PRESS, Waterbury-Farrel High Speed 60 tons #3W.
PRESS, 66 C Bliss Double Action, 3 crank.
PRESS, Lucas 15 tons Power Arbor, M.D.
PRESS, #68 Whitney Deep Thr. 24", foot.
PRESS, P2, P3 Ferracute M.D. Roll feed.
WHEEL PRESS, 600 ton Niles Bement Pond, A.C.
PANTOGRAPH, #1A Gorton M.D. Engraving.
PUNCH, #46 Buffalo Forge Vert. Cap. 1"x1½" M.D.
PUNCH, R-4 Wiedemann Turret, 10 Stat. 24" thr.
PUNCH, Hecker Turret, 8 station, cap. 2½" hole.
PUNCH, H & J #2 Sgle. End, 24" Thr. 1" thru 1".
PUNCH, H & J #4, 48" thr., with Shear Blades.

RIVET SETTER, ⅜" cap. Penn. Tubular Rivet.
ROLLS, Bertsch Pyramid 18"x1¼" cap., M.D., Late.
ROLLS, #1 Buffalo Forge Wrapping, M.D.
ROLLS, 72"x¼" Lown Initial M.D., New.
ROLLS, #2 Buffalo Forge Vert. Angle, Bending, New

COLD SAW, Wagner 10"x10" cap., M.D.
COLD SAW, Espen-Lucas #700, 48" dia. blade, M.D.
CUT-OFF SAW, Yates-American #M-90, M.D.
SAW, #4B Marvel Hack Saw 6"x6" Cap., M.D.
SAW, #20-C Racine Shear Cut 6"x6" cap., M.D.
SAW, Band Tannewitz GH-36" High Speed, M.D.
SHAPER, 16" Pratt & Whitney Crank, M.D.
SHAPER, 20" Rockford Univ. M.D., Tilting Table.
SHAPER, G & E 24", high duty, back geared, M.D.
SHAPER, 32" Cincl., B.G., Motor Driven, H.D.
SHAPER, Morton, 36" Draw-Cut, 4 speed M.D.
SHEAR, 6' x 14 ga. Parker M.D., Late Type.
SHEAR, #26 Bunzle Forge Slitting Armor Plate.
SHEAR, Quickwork #11 Rotary 60" Throat, 10 ga.
SHEAR, 10' x 10 ga. Wysong & Miles, M.D., New
SCREW SLOTTER, #2 Waterbury Farrel Auto.
SLOTTER, 12" New Haven Vertical, M.D.
SPOTTER & SCRAPER, Anderson Power Unit, Late.
SPRU CUTTER, Milwaukee 56 tons, 2½ cap., M.D.
SURFACE PLATES & TABLES, all sizes.
TAPPER, #1 Cam Haskins, Motor Driven, Late.
TAPPER, #1 Bakewell (Warner & Swasey) Late.
TRUCK, 2000 lbs. Hyster Fork Lift 9' Model QT-20.
TRUCK, 4000 lbs. LT-44 Towmotor Fork, Lift 9'.
BRINELL TESTER MACHINE, Type UK300M.
BRINELL TESTER, Type 03DR, Steel City.
WELDER, 500 amp. Westinghouse Flexers A.C.
WELDER, 200 & 400 amps. Gen. Elec. Portable Arc.
WELDER, 75 KVA Federal M.D., Spot.
WELDER, 200 KVA Federal, Projection.
WIRE STITCHER, Morrison & Acme, M. D.

OVER 2000 MACHINE TOOLS AVAILABLE IN STOCK

• LATHE CHUCKS •

• COMPARE THESE PRICES •

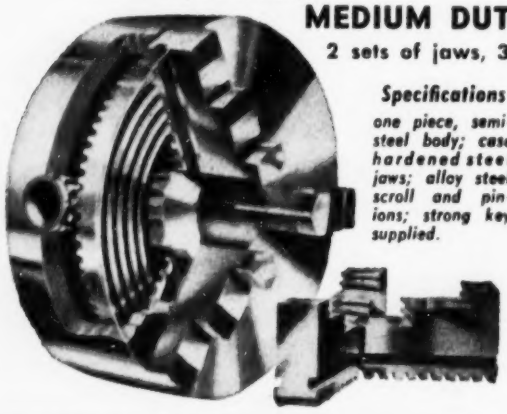
ACT QUICKLY WHILE OUR STOCK LASTS

BRAND NEW • ABSOLUTELY GUARANTEED

• RUGGED CONSTRUCTION

IMMEDIATE DELIVERY FROM STOCK

These lathe chucks, manufactured in England are equivalent in all respects to chucks selling here for two and three times the price. All are absolutely guaranteed with respect to accuracy, workmanship, and strength.



MEDIUM DUTY 3 JAW UNIVERSAL CHUCKS

2 sets of jaws, 3 pinions, for use with intermediate backplate.

Specifications

one piece, semi-steel body; case hardened steel jaws; alloy steel scroll and pinions; strong key supplied.

Size	Weight	Price	Price Soft Jaws
2¾"	2½ lbs.	$ 25.00	$ 5.00
3¼"	3½	26.50	6.50
4"	6½	30.00	7.50
5"	12	37.50	9.00
6"	17½	45.00	10.00
7½"	29	57.50	13.50
9"	42	67.50	15.00
10½"	62	95.00	20.00
12"	88	125.00	22.50
15"	143	175.00	25.00
18"	200	250.00	35.00
24"	324	325.00	45.00

Steel body chucks are also available in some sizes.
Soft jaws and spare parts are immediately available from New York stock.

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QUALITY MACHINERY AT LESS THAN ½ NEW COST

**Note: Late Type Machines Are Indicated with an Asterisk*

BORING MACHINE

*MOLINE Cylinder Boring Machine 3 in-line adjustable, center boring heads, 20 HP drives, Max. Centers 10'

COLD SAW

*ESPEN-LUCAS Model 8, 24" cap.

DRILLING MACHINES

*BAKER 60HH Horizontal Way Type Drill
*W. F. & JOHN BARNES 6 spindle Vertical Deep Hole Drill
BODINE Model 42-30 Automatic, Dial Type, Drilling & Reaming Machine
*BODINE Model 48-30 Automatic, Dial Type, Drilling & Reaming Machine
*NATCO B2F1 Horizontal Deep Hole Drill. Max. cap. 2"x36" depth
PRATT & WHITNEY 2 spindle Deep Hole Drill, 1½"x129" cap.

GEAR MACHINES

BARBER COLMAN No. 2 Gear Hobber
BARBER COLMAN No. 12 Gear Hobber
BROWN & SHARPE 4-48 Gear Cutter
*CLEVELAND Model 130 Gear Hobber
*CLEVELAND Model 220, 8 spindle Gear Hobber
*FELLOWS No. 7AS Spline Shaper
*FELLOWS Model 7LS Gear Lapper
*FELLOWS No. 30 Gear Shaper
*FELLOWS No. 712 Spline Cutter
FOOTE-BURTE 16 Spindle, Vertical, Rotary Indexing Table
*GEAR GRINDING MACHINE, Model GG-19 10"x24" Gear Grinder
*GEAR GRINDING MACHINE MODEL 5G11 Spline Grinder
*GLEASON No. 1 Gear Tooth Flame Hardner
*GLEASON 15" Quench Press
*GLEASON No. 17 Hypoid Gear Grinder
GLEASON 18" Straight Bevel Gear Generator
GOULD & EBERHARDT 96" Gear Cutter
*MICHIGAN No. 860A Gear Shaver
*PRATT & WHITNEY 10" Single Wheel Spur and Helical Gear Grinder

GRINDERS

*BRYANT No. 5 Internal Grinder
*BRYANT Model 16-16 Internal Grinder
*BRYANT Model 16-28 Internal Grinder
*BRYANT Model 16A Internal Grinder
*BRYANT Model 16-A-28 Internal Grinder
*BRYANT Model 16CR16 internal Grinder
*EXCELLO Model 33 Thread Grinder
*NORTON External, cylindrical 45° angular wheel slide head
*NORTON 6"x42" centers Cam-O-Matic Grinder
NORTON, Cam, 5-48
NORTON, Cylindrical, 10-72
*MUMMERT-DIXON Snagging Grinder swing frame type

HONE

*MICROMATIC Model H500 Horizontal Hone

LATHES

*WICKES Model DH8 Crankshaft Lathe
*WICKES Model UH4 Crankshaft Lathe
*LIBBY 4R Turret Lathe
POTTER & JOHNSON, 6A

SCREW MACHINE

*GIBBS Model 375 Single Spindle Swiss Type Automatic Screw Machine

SHELL REAMER

*KAUFMAN Hydraulic Shell Reamer

MISCELLANEOUS

HORNING Press, 35 ton
RANSOME 3000 lb. Welding Positioner
USMC Model B Eyelet Setter
*HALL PLANETARY Type C Thread Mill
BELLEVUE Model 321 Aluminum Melting Furnace
*RANSOME 2500 lb., Model 12T Welding Positioner Tailstock
*RANSOME 3000 lb., Model 13T Welding Positioner Tailstock
*SHARPLES CORP. Type M-61-21-18B2 Clarifier
*DELAVAL Model 194-61 Hermetic Coolant Clarifier

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Eastern Rebuilt Machine Tools

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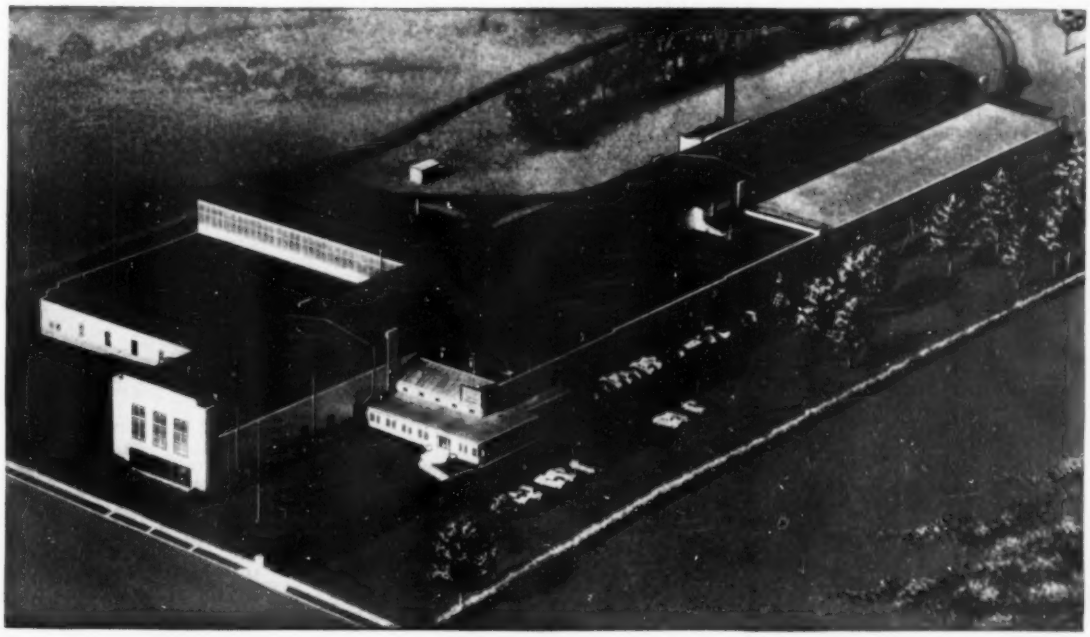

HAMMER

1100# Chambersburg Single High Frame Steam Hammer

HONING MACHINES

H1 Micromatic Horizontal Hydrohoner, m.d.
H4 Micromatic Horizontal Hydrohoner, m.d.
No. 6 Barnes Twin Spindle
Model #182 Barnesdrill Hone, m.d., latest

MANUFACTURING LATHES

No. 3 Lodge & Shipley Duomatic, m.d., late type
Model B1—¾ H.P. Blount Speed Lathe, m.d.
W. C. Lipe Caromatic Lathe, m.d.
Colborne Mfg. Bench Type Speed Lathe, m.d.
No. 4 LeBlond Boring Lathe, 37" bed, 4" hole, m.d., latest
No. 9, No. 12 LeBlond Multi-Cut, m.d.
3½x36", 3½x80", 4x60", 8x84" LoSwing, m.d.
8x132" LoSwing, m.d., latest
9x12" Sundstrand, s.p.d.
11x18" LeBlond Rapid Production, m.d.
12x18" centers Monarch Model 5T, m.d.
Schauer Type NA 2B Speed Lathe, m.d., latest
30"x10' LeBlond Turning Lathe, cone

ENGINE LATHES

12"x6' Lodge & Shipley Geared Head, m.d., taper
13"x5' bed Willard, cone, motorized
14"x6' American High Duty Geared Head, m.d., taper
14"x6' Hendey Geared Head, m.d., taper
14"x6' Lodge & Shipley Geared Head, m.d.
14"x6' Lodge & Shipley, cone, motorized
14"x6' Pratt & Whitney, cone
14"x6' LeBlond, cone
14"x6' LeBlond Geared Head, s.p.d.
14"x6' bed Monarch, cone, motorized
14"x6' Sidney Geared Head, m.d.
14"x6' Springfield Geared Head, m.d., taper
14"x8' Sidney Geared Head, m.d.
14"x8' Prentice, m.d., taper
16"x6' bed Cisco Geared Head, m.d.
16"x6' Hendey Geared Head, m.d.
16"x6' Hendey Yoke Head, taper
16"x6' Lehmann Geared Head, m.d.
16"x6' Lodge & Shipley Selective Head, m.d.
16"x6' Lodge & Shipley, cone
16"x6' bed Monarch Geared Head, m.d.
16"x72" centers American, m.d., taper
16"x84" Pratt & Whitney Type B, m.d.
16"x8' bed Reed-Prentice, cone, taper
16"x8' Monarch, cone, motorized
16"x12' bed LeBlond Geared Head, m.d., taper
17"x6' LeBlond Geared Head, m.d.
18"x5' LeBlond Geared Head, m.d.
18"x6' bed Lodge & Shipley, cone, motorized
18"x6'6" bed Greaves-Klusman Geared Head, m.d.
18"x7' Hendey Geared Head, m.d., taper
18"x8' bed American Geared Head, m.d.
18"x8' Hendey Geared Head, m.d., taper
18"x8' Lodge & Shipley Geared Head, m.d.
18"x8' Whitcomb-Blaisdell Geared Head, s.p.d.
18"x8'6" bed Walcott, cone, motorized
18"x10' bed Boye & Emmes, m.d.
18"x10'6" bed Boye & Emmes, cone, motorized
19"x6' bed LeBlond, Geared Head, m.d., later type
19"x10' bed LeBlond H.D., m.d.
20"x8' bed American Geared Head, m.d., taper
20"x8' Cisco, cone, motorized
20"x8' bed Greaves-Klusman Geared Head, m.d. in leg
20"x8' bed Boye & Emmes, m.d.
20"-40"x8' bed Rahn-Larmon Gap Lathe, cone, motorized
20"x10' Sidney Geared Head, m.d.
20"x10'6" Boye & Emmes, cone, motorized
21"x8' bed LeBlond Geared Head, m.d., taper
21"x10' LeBlond Geared Head, m.d.
21"x14' bed LeBlond Geared Head, m.d., later type
23"x12' LeBlond Geared Head, m.d., taper
23"x12' bed LeBlond, cone, motorized
24"x12' bed Boye & Emmes, belt drive
24"x12' Bridgeford Geared Head, m.d., taper
24"x16' bed Lodge & Shipley, cone, motorized, taper
25"x10' bed LeBlond Geared Head, m.d., taper
25"x12' bed Geared Head LeBlond, m.d., taper
25'—50"x6' centers LeBlond Gap Lathe, m.d.
2/"x14' bed LeBlond Heavy Duty, Geared Head, m.d., taper, late
27"x16' bed Lodge & Shipley Geared Head, m.d., taper
27"x24' bed American Heavy Duty, Geared Head, m.d., taper, late type
30"x12'6" bed Niles-Bement-Pond, variable speed m.d., taper
30"x13'6" bed Niles-Bement-Pond, m.d.
30"x15' bed American Geared Head, m.d.
30'-44"x15' bed American Geared Head, m.d.
36"x6' centers American Super-Productive, m.d.
36"x16'6" bed Boye & Emmes Geared Head, m.d.
42" Putnam (raised to swing 56½") x 20' bed Geared Head, m.d., 11'8" centers
42"x22' Schumacher & Boye, cone, motorized, taper
42"x180" American Super-Productive Lathe, m.d., taper

HAND MILLING MACHINE

No. 3 Garvin, m.d.

UNIVERSAL MILLING MACHINES

No. 2½ LeBlond Heavy Duty, cone, motorized
No. 3A Brown & Sharpe Standard, m.d., later type

IN ADDITION TO THE ABOVE, WE ALSO HAVE IN STOCK AUTOMATICS, BOLT THREADERS, HORIZONTAL AND VERTICAL BORING MILLS, BROACHES, RADIAL DRILLS, BALL BEARING DRILLS, HORIZONTAL DRILLS, MULTIPLE SPINDLE DRILLS, UPRIGHT DRILLS, GEAR MACHINERY, GRINDERS, RAILROAD MACHINERY, PLANERS, PRESSES, SAWS, SHAPERS, TURRET LATHES, ETC.

WRITE FOR COMPLETE STOCK LIST

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1004 Tennessee Avenue, Cincinnati 29, Ohio
MElrose 1241
CABLE ADDRESS
EMCO

Let MacDell Help You . . . . If-

immediate expansion is your problem; especially where DELIVERY and ECONOMY are important factors. Every one of our machines is unconditionally guaranteed and practically any machine can be inspected—under power.

BALANCERS
GISHOLT 3S Dymetric Balancer, 1943.
GISHOLT 12E Static, 1948.

BENDING ROLLS
SOUTHWARK 20'x1" Pyramid Type, Drop End, Balance Bar.

BORING MACHINES
HEALD #49 Double End Bore-Matic, 1942.
EXCELLO 1212 Double End, 1935.

DRILLS
Avey 6-Spindle No. 2MA6 Power Feed, No. 2 MT, 12" Overhang, 1943.

IMMEDIATE SHIPMENT . . .

TYPE "D"

MULT-AU-MATIC

We have a BULLARD 12" 8 Spindle Type "D" Mult-Au-Matic, 1941, Power Chucking, available for immediate delivery. This late type machine is well tooled.

It will be offered to you at a substantial savings — compared with replacement cost. We'll be happy to send complete specifications and complete list of tooling.

ALLEN No. 2 MS Single Spindle, No. 2 MT, Power Feed, 12" Overhang.

GEAR EQUIPMENT
BARBER-COLEMAN Model A Gear Hobber, 1943.
FELLOWS 61A Gear Shaper, 1941.
PRATT & WHITNEY 10" Hydraulic, 2 Wheel Gear Grinders (2), 1941.

GRINDERS, CYLINDRICAL
NORTON 10"x18" Type C Hydraulic, 1942.
BROWN & SHARPE No. 5 3"x18" Plain with Plunge Grinding, 1943.
BROWN & SHARPE No. 5 3"x12" Plain with Plunge Grinding, 1941.

GRINDERS, MISC.
NORTON 6"x18" Hydraulic Surface, 2 available, 1942 and 1943.
HEALD No. 72A3 Plain Cross Sliding Head, Riser Blocks, Cam Attach., 1941.
HEALD No. 25A 16" Rotary Surface, 1942.
HEALD No. 22 Rotary Surface, 12" Chuck, 1941.

LATHES, AUTOMATIC & PRODUCTION
POTTER & JOHNSON 5D Automatic Chucker with Air Chucking Equipment, 2 available, 1942.
SUNDSTRAND 12A Automatic Lathe, Air Equipment, 1951.
LODGE & SHIPLEY 3A Duomatic, 1946.

SENECA FALLS Model R-14 Lo-Swing, 1942.
SENECA FALLS Model LR Lo-Swing, complete, 1942.

LATHES, ENGINE
NILES 30"x144" centers, Timesaver T.A. Chuck, 1941.

LATHES, TURRET
GISHOLT 1L Saddle Type Bar and Chuck, 1944.
GISHOLT No. 4 Ram type Universal. Bar feed, 1944.

MILLS
CINCINNATI 56-90 Plain Hydromatic.
KEARNEY & TRECKER 2K Vertical, 1943.
KEARNEY & TRECKER 2HL Plain, 1943.
CINCINNATI 2-24 Rise and Fall, 1942.
CINCINNATI 1-18 Plain Automatic.
CLIMB Milling Auto. Spdle. Stop, 1941.
KENT OWENS 2-20 Hydraulic Positive Stop, 1942.
SUNDSTRAND No. 0 Rigidmill 18" table travel. Electronic close stop and dwell, 1943.
KEARNEY & TRECKER Model 1H—18" Manufacturing Mill, 1941.
U. S. MULTI-MILLER MM-1-5-2 Rise and Fall, 1943.
U. S. MULTI-MILLER MM-1-60, 1944.

MULT-AU-MATICS
BULLARD 12" 8-Spindle, Type D, with Power Chuck and Tooling, 1941.

SAWS
RACINE 14"x20" Model 40 Hydraulic Shear Cut, 1943.

. . . TELEPHONE MOnroe 6-7715 . . .

MacDell CORPORATION
1042 W. LAKE ST. • CHICAGO 7, ILL.

Special Offering

35—#00-G BROWN & SHARPE

AUTOMATICS

Mfg. in 1940-1941

Price $2450.00 Ea.

Can Be Inspected Under Power in Our Warehouse

INDIANAPOLIS MACHINERY & SUPPLY CO.
1965 S. Meridian, Indianapolis, Ind.

NILES TIME-SAVER LATHE
Late Type
27" x 16' between centers
WINSTON MACHINERY CO., INC.
326 W. Ohio St., Indianapolis 2, Ind.

10' BETTS
VERTICAL BORING MILL

3 1/8" FOSDICK
HORIZONTAL BORING MILL
108" Spindle to outboard support.

CLARENCE J. O'BRIEN
1032 Commercial Trust Bldg.
Philadelphia 2, Pa.

LATE TYPE TOOLS

KEARNEY & TRECKER, #5H, Horiz. Mill with Vert. Head, 1943.
KEARNEY & TRECKER, #4H, Vert. Mill, 1943.
NORTON, 10" x 18" Cyl. Grinder, 1942.
GISHOLT, 1L Turret Lathe, 1945.

BARR MACHINERY COMPANY
Toolroom and Production Equipment Shop Supplies
813-11 W. Lake St., Chicago 7, Ill.

NEW
MELTING FURNACES FOR SALE

3—New **BELLEVUE** (round-type) furnaces equipped for gas—Capacity 700 lbs. zinc—Outside dimensions—34" dia., 25¾" high. Price—$350.00 each

1—New **FISHER** melting furnace with crucible for 300 lbs. aluminum. Complete with fuel and air equipment for gas. Control valve motor 110 volt, 60 cycle single phase. Type A-101-0102 centrifugal blower, direct connected to 220/440 volt 3HP-60CY-motor for operation on 220/440V-60CY-current, complete with starter for 110V control and pushbutton. Price—$1100.00

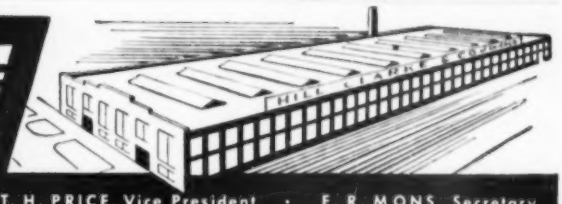
REED-PRENTICE CORP.
WORCESTER 4, MASS.

LIBBY
TURRET LATHE

International Machine Tool Co. Serial #837. 3 Jaw Universal chuck 16". Size 18 Style A. Hole in Spindle 3⅛". Swing 18". Turret Travel 44". Cross Slide Travel 40. T. L. Motor. Wagner Electric Co. Type 13 TRW. 220 V—3 phase—60 cycle. 5 HP—1140 rpm. Serial #342342.

STARDRILL KEYSTONE CO.
920-17th St., Beaver Falls, Pa.
Phone 69—Contact D. W. Colvin

HILL-CLARKE MACHINERY COMPANY



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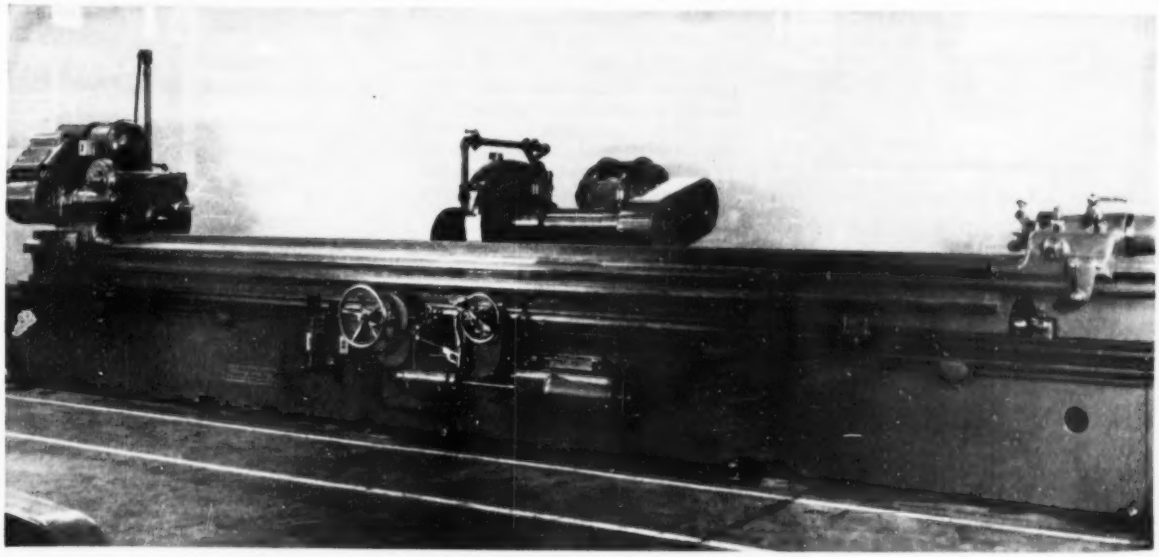

NORTON CYLINDRICAL GRINDER 24" Swing x 264" (22 feet) between centers

AUTOMATICS

1-1/16" Model A Cleveland (1942)

DRILLS

1 Spdl—14" Sw—No. 2 Avey Cam Fd.
1 Spdl.—26" Sw.—No. 2 LMS Leland-Gifford
1 Spdl.—30" Sw.—No. 4 taper Aurora
2 Spdl—24/ Sw—No. 3 Avey
12 Spdl. D-31 Fox, No. 2 Taper

GEAR MACHINES

No. 12HS Gould & Eberhardt Hobber
11" Gleason Bevel Gear Generator
No. 64 Fellows Gear Shaper
No. 36-BM G & E 3 Spdl, Rougher
No. 612-A Fellows Gear Shaper
No. 615-A Fellows Gear Shaper
No. 65 Fellows—Cone Dr.
8" cap Red Ring Gear Lapper

GRINDERS

6" x 18" Landis (1942)
6" x 18" Norton Cylindrical (1943)
10" x 48" Norton type C (1943)
Hill-Clarke Cylindrical Grinders
10"x36" centers
10"x72" centers
18"x96" centers
24x32 Gap x 144" centers
14"x36" centers 14"x72" centers
14"x96" centers 18"x96" centers
20"x96" centers
24"x264" centers
No. A-3—12" Arter Rotary Surf.
No. 1109 Bryant Internal Grd. (1951)
(9" swing—1" bore x 3½" grind stroke)
No. 5 Bryant Internal Grd.
No. 5B Bryant Internal Grd.
No. 16-16 Bryant Internal Grd.
No. 16-A-16 Bryant Internal Grd.
No. 16-28 Bryant Internal Grd.
No. 16 A-28 Bryant Internal Grd.

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•

Your Worn Machines Can Be "NEW" AGAIN

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HILL-CLARKE
Gives You the Finest Re-manufacturing Obtainable

No. 16 F-28 Bryant Internal Grd.
No. 24-26 Bryant Internal Grd.
No. 24-36 Bryant Internal Grd.
No. 81 Heald Centerless Internal
No. 74 Heald Internal Centerless

HORIZONTAL BORING MACHINES

No. 45—4½" Giddings & Lewis

LATHES

16"x33" R-14 Seneca Falls Auto. Lathe
18"x6' American Geared Head Lathe
19"x8' LeBlond Hvy. Duty Lathe
27"x12' American Geared Hd. Lathe
27"x12' centers LeBlond Lathe
36"x18' Putnam Grd. Hd. M.D.
5W Acme Ram type Tur., 2" Capacity
No. 6 Warner & Swasey Tur.-Bar Fd.
18" Libby Tur. Lathe, M.D.
No. 3AL Gisholt Cross-Slide Tur.
No. 4A Warner & Swasey—7½" Hole—Spdl.

MILLING MACHINES

No. 08 Cincinnati Vert. Mill (1942)
54"x30"x16' Ingersoll Slab Mill
6"x168" Pratt & Whitney Thrd. Mill
10"x48" Hanson-Whitney (1942)
10"x60" Pratt & Whitney Thrd. Mill
12"x102" Lees-Bradner Thrd. Mill

PLANERS

36"x36"x12' Cincinati, 2 hds.
48"x36"x14' Gray, 2 hds.
48"x48"x12' Cincinnati, 2 hds.
60"x48"x27' American, 4 hds.

MISCELLANEOUS

1"-2" Dia. Cap. Micro. Hor. Hone—#200
¼"-1" Dia. Cap. Micro. Hor. Hone—#H-2
42"—18 gage Economy Power Shear
75 Ton R & K Straight Side Press
3 Ton Fox Hydraulic Press
2—12"x96" Magnetic Chucks
20'x1" cap Southwark Roll
15" Dill Slotter
18" Dill Slotter
38" Morton Draw-Cut Shaper (1945)
No. 0 Bakewell Tapper

FULL MONEY-BACK GUARANTEE

1. Hill-Clarke always give you and unconditional money-back guarantee.
2. All machines in stock.
3. You can see your machine run and tested under power in our plant before purchasing.
4. Complete and modern facilities plus experienced craftsmen for REMANUFACTURING machine tools in our 58,000 sq. ft. plant.
5. A responsible organization—established 1867

Write, Wire or Phone **HILL-CLARKE MACHINERY COMPANY**
651 WASHINGTON BOULEVARD, CHICAGO 6, ILL. PHONE CEntral 6-0500

HEADLINERS

LATHES

19"x48" ctrs LeBlond Grd. Hd., a.c., m.d., taper 36" (raised to 44") x 154" ctrs American 16-speed Grd. Hd., a.c. m.d.
14"x30" Lodge & Shipley Selec. Grd. Hd.
20"x72" ctrs Lodge & Shipley Selec. Grd. Hd., a.c. m.d.
22"x74" ctrs Lodge & Shipley Selec. Grd. Hd., a.c. m.d., taper
24"x60" ctrs American Heavy Patt. Grd Hd., a.c. m.d., taper
36"x96" ctrs Schumacher & Boye Triple Grd., cone, taper
36"x120" ctrs American Grd. Hd., a.c. m.d., taper

TURRET LATHES

No. 1-A Warner & Swasey, Timken, covered ways
No. 2 Acme Full Universal, Timken, hard ways
No. 601-DD Oster "Rapiduction"

VERT. TURRET LATHES & BORING MILLS

24" Bullard "New Era", side head
36/44" Niles-Bement-Pond, side head
42" King, two heads, p.r.t.

MILLING MACHINES

No. 4 Cincinnati High Power Vertical, a.c. m.d.
No. 36 Van Norman, new 1943
No. 4 Cincinnati High Power Universal, a.c. m.d., div. hds.
No. 4-B Brown & Sharpe Heavy Plain
No. 1224 Milwaukee Simplex, late type

GRINDERS

10"x18" Norton Plain, a.c. m.d.
10"x24" Landis Plain Self-contained, a.c. m.d.
10"x48" Landis Type C Plain Hydraulic, late
No. 13 Brown & Sharpe Universal & Tool, late
No. 49-53" Besley Vert. Spindle Disc
No. 81 Heald Internal, chucking, Size-matic, Gage-matic

GEAR MACHINERY

No. 3-26 Brown & Sharpe, a.c. m.d.
No. 5A Cincinnati 60"x16", a.c. m.d.
No. 12 Barber-Colman Hobbers
No. 18HM Gould & Eberhardt 2-spindle Hobber
No. 18H Gould & Eberhardt Hobber, a.c. m.d.
6", 11", 18" Gleason Bevel Gear Generators
No. 7 Fellows High Speed Shapers

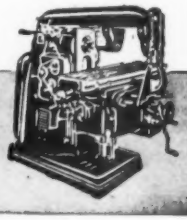
PLANERS

42"x42"x14' Niles-Bement-Pond Heavy Patt., d.c. m.d.
42"x42"x16' Gray, arr. m.d.

MISCELLANEOUS

1¼" Cone 4-spindle Automatic, bar feed, a.c. m.d.
No. 77 Toledo 85-ton Open Back Press
36" Morton Draw-Cut Shaper
7"x7" Peerless "Mechani-Cut" Saw, a.c. m.d.

Many other machines in stock. Send us your inquiries.



COX MACHINERY COMPANY, INC.

3 MINUTES FROM THE CINCINNATI HOTEL DISTRICT

P. O. BOX 1953 CINCINNATI 1; OHIO
Office&Warehouse 311-313 Bakewell St.,Covington,Ky.

LATE MODEL MACHINE TOOLS . .

AUTOMATICS

No. 656 New Britain Chucker, 1943
1½" 6 Spdl. Cone Automatic, 1941
2" Model A Cleveland, 1941.
1-1/16" Model A Cleveland, 1943
No. 00G Brown & Sharpe, 1941.

BOREMATICS

No. 2112 Excello Single End. Late
No. 40 Heald Double End, 1942.

BROACHES

HP-100 La Pointe Horiz. Broach, 1945.

DRILLS

Ma-6 Avey 4 Spindle, H.F. 1943.
Allen Single Spindle Drill & Tapper, 1942
No. 2 LMS Leland-Gifford H.F. 1942.

GEAR EQUIPMENT

No. 7 Gleason "Revex" Rougher, 1943
No. 6 Gleason Revacycle Generator, 1940.
No. 72 Fellows H.S. Gear Shaper, 1942.
10" Pratt & Whitney Hyd. Gear Grinder, '42

GRINDERS, CYLINDRICAL

10"x18" Norton Plain Type "C", 1940.
6"x30" No. 12 B & S Hydraulic, 1940.
No. 2 Cincinnati Centerless Grinder, 1944

GRINDERS, INTERNAL

No. 72-A3 Heald Plain Hydraulic, 1942
No. 24-36 Bryant Hydraulic, 1943.
No. 16A28 Bryant Hole & Face, 1942.
No. 16 CF 16 Bryant Hydraulic, 1942.
No. 16-16 Bryant Hydraulic, 1942.
No. 172 Heald Hydraulic, Gap, 1940.

GRINDERS MISCELLANEOUS

No. 18A Blanchard Auto. Surface, 1942.
Cincinnati Centerless Lapper, 1942.
SG-11 Gear Grind Spline Grinder, 1942.
HRS Barber-Colman, 1942.

GUN BARREL MACHINES

No. ½ B x 50 P & W Reamer, Latest.
No. ½ B x 30 P & W Reamer, Latest.
No. ½ B x 50 P & W Rifler, Latest.

LATHES, ENGINE

27"x192" Niles Timesaver, 2 Carr, 1941.
27"x96" Niles Timesaver, 1940.
26"x180" Betts Bridgeford, 1940.
26"x96" Betts Bridgeford, 1940.

LATHES, PRODUCTION

8"x84" Lo-Swing Semi-automatic, 1941.

LATHES, TURRET

36" Bullard VTL, Spiral, Late.
No. 2A Warner & Swasey Saddle Type, 1940.
No. 1A Warner & Swasey Saddle Type, 1941.
No. 1L Gisholt Saddle Type, Late.
No. 3R Gisholt Universal Saddle Type, 1943.
No. HS Libby Universal Saddle Type, 1939.
No. 5 GISHOLT Universal Ram Type, 1942.

MILLS, PRODUCTION

No. 1848 Milwaukee Duplex, 1942.
No. 2-16 Cincinnati Automatic, 1942.
M-18 Milwaukee, 1943.
No. 3 Cincinnati Univ. Dial Type.
No. 08 CINCINNATI Rise and Fall, 1942.

MILLS, TOOL ROOM

No. 3 Van Norman Plain, 1942.
No. 22L Van Norman Plain, 1943.
No. 2 Saimp Vertical New.
No. 2 Saimp Universal, New.
No. 3 Saimp Plain & Vertical, New.
No. 4 Saimp Vertical, New.

SHAPERS

32" Ohio Heavy Duty Univ. 1951
16" Gernetti Universal Shaper, New
20" Gernetti Universal Shaper, New
24" Gernetti Universal Shaper, New

Partial Listing — Write for latest stock list

INDIANAPOLIS *Machinery & Supply Co.*

1961 S. Meridian St. . . Indianapolis, Indiana

3'11" DRESES Radial Drill
30"x16' bed AMERICAN High Duty Geared Head Lathe
42"x15' AMERICAN Heavy Duty Lathe
42"x25' centers AMERICAN Heavy Duty Lathe
No. 172 HEALD Gap Internal Grinding Machine for large swing
6"x18" LANDIS Type C Plain Grinder
10"x72" LANDIS Type C Hyd. Pl. Grinder—1942
Nos. 4D and 6S POTTER & JOHNSTON Automatic Lathes
Nos. 8A & 9A JONES & LAMSON Saddle Type Universal Heavy Duty Turret Lathe
No. 5 CINCINNATI Plain High Power Miller.
No. 0-8 CINCINNATI Plain Milling Machines
No. 2M CINCINNATI Vertical Miller, 1941
No. 1-18 CINCINNATI Plain Mfg. Miller
No. 12 B&S Plain Bed Type Production Miller
6"x60" P & W Model C Thread Miller
Type A BARBER-COLMAN Gear Hobber
No. 64 Fellows Gear Shaper
No. 72 FELLOWS High Speed Gear Shaper
No. 12 FELLOWS Gear Shaver, 1943
No. 36BM GOULD & EBERHARDT Gear Rougher
16/20" GOULD & EBERHARDT Industrial Shaper
100" BETTS Vertical Boring Mill, 2 heads

WIGGLESWORTH INDUSTRIAL CORPORATION
203 Bent St., Cambridge 41, Mass.

BULLDOZER

Rock River Machine Co., Size #4—Stroke 20"—Motor—Allis Chalmers—10 HP—860 rpm—220 volt—3 phase—60 cycle—Serial #84110.

STARDRILL KEYSTONE CO.
920—17th Street, Beaver Falls, Pa.
Contact D. W. Colvic. Phone 69

No 2 B & S High Speed Autos. M.D.
No. 25 Heald Rotary Surface Grinder.
P & W 30" Vert. 2-spindle Profiler.
Peerless 6½" x 6½" Hack Saw, hyd.

D. E. DONY MACHINERY CO.
4357 St. Paul Blvd., Rochester 17, N. Y.

1941-1953 MACHINE TOOLS

IMMEDIATE DELIVERY — NO PRIORITIES NEEDED

CAM MILLERS

VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

CENTERING MACHINES

SUNDSTRAND: 44" Double End Centering Machine

CUTTER & TOOL GRINDERS

FELLOWS: Flat Top Helical Gear Cutter Grinder
OLIVER: 10" Template Tool Bit
RANSOM: 2-Wheel Grinder 3 HP
RUSSELL: 40" Saw Sharpener (New) automatic indexing

DRILLING MACHINES

ALLEN: #2 High Speed, 15" overhang
PRATT & WHITNEY: ½B x 50 Deep Hole Drilling & Reaming Machine, 2-spindle
SUNDSTRAND: 44" Double End Centering Machine

GEAR CUTTING MACHINES

BROWN & SHARPE: No. 6 Gear Cutter, 72" diameter, 1¾ D. P. capacity
CLEVELAND: Model 130 Gear Hobber (like new)
CLEVELAND: Model 140 Gear Hobber (like new)
FELLOWS: 61A Shaper, 18" dia.
FELLOWS: 64A Shaper, 18" dia.
FELLOWS: 72 Shaper, 7" dia.
FELLOWS: Flat Top Helical Gear Cutter Grinder
FELLOWS: Straight Line Generator, 3" dia. with many cutters
GLEASON: #12 Rough & Finish Gen.
GLEASON: 3" Straight Bevel Gear
SYKES: Gear Shaper 14" external, 20" internal (New)
SYKES: Rack Cutting Machine 12" to 36" length capacity (New)

GEAR AND SPLINE GRINDERS

PRATT & WHITNEY: 10" single and double wheel, hydraulic feed
GEAR GRIND MACH: GG-19, 10"x 24" Hydr. Spur Gears and Splines

GEAR FINISHERS & TESTERS

FELLOWS: 8 LSI and 13 LSI Gear Lappers, external and internal spur and helical
FELLOWS: #12C Cone & Spacing Inspec on Instrument
GLEASON: No. 4 and No. 6 Bevel Gear Testers. Hand and Power
NATIONAL BROACH: SIC-12" Red Ring Gear Testing Machine

GRINDERS—CYLINDRICAL

BROWN & SHARPE: No. 10 capacity 6"x18" plain
CINCINNATI, 6"x18" Hydraulic, Plain

3-WAY GUARANTEE

1. Should any machinery purchased from us prove unsatisfactory, you can return the machines within 30 days, via freight prepaid to our plant, and a full refund will be made.
2. Machines at our plant can be demonstrated and tested under power before purchasing.
3. You are dealing with a well-established, highly-rated firm of machinery engineers with over 33 years of proven responsibility.

LANDIS: 16x32" Type "D" Crankpin, hydraulic, for grinding crankshafts
NORTON: 10"x18" 45° angle wheel

GRINDERS—GEAR & SPLINE

GEAR GRIND MACH.: GG-19, 10"x 24" Hydr. Spur Gears and Splines
PRATT & WHITNEY: 10" single and double wheel, hydraulic feed

GRINDERS—INTERNAL

BRYANT, 16-16 Internal Hydraulic
BRYANT: No. 5Y Internal
HEALD: 72A3 Sizematic Centerless

GRINDERS—RADIUS

VAN NORMAN: #73, capacity 7½"
VAN NORMAN: #639, capacity 7"
VAN NORMAN: #649, capacity 6" to 16" diameter
VAN NORMAN: #3½ Un. Radius

GRINDERS—THREAD

EXCELLO: #31 External, dia. 5"x18"
JONES & LAMSON: #636 Universal, 6" dia. x 36" centers and one extra multiform wheel dressing attachment

HONING MACHINES

MICROMATIC: H-510 Double End Horizontal, ¾" to 2" dia.
MICROMATIC: H-2 Single End Horizontal, 2-spindle, ¼" to 1" dia.

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FELLOWS: 8LSI and 13 LSI Gear Lappers, external and internal spur and helical

LATHES PRODUCTION

BLOUNT: Polishing speed lathe 12" dia. x 48" centers
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New Engine Lathe 27" swing x 23' centers

LATHES—TURRET

WARNER & SWASEY: 1A, 2A, 3A & 4A
WARNER & SWASEY #3, #4 & #5 Turret Lathes
HERBERT: #2, #4, #7, and #8 Sizes (new)
WEBSTER & BENNETT: Vertical Turret Lathes 36" & 48" (New)

MILLING MACHINES

TAYLOR-FENN: M-80 Duplex Spline
RICE-BARTON: Duplex Spline
VAN NORMAN: 10CT Contour Miller, horizontal opposed spindle type for milling flat cams, also can be converted to similar work

SAWS & CUT-OFF MACHINES

CAMPBELL: No. 425 Cutalator Abrasive Cut-Off, 4½" dia. capacity
MOTCH & MERRYWEATHER: No. 3 Circular Saw with auto. stock feed
RUSSELL: 9½" cut-off Saw with Auto. Stock Feed (New) Hydraulic
RUSSELL: 5½" dia. cut-off saws, auto stock feed, hydraulic (New)

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HALL PLANETARY: Model "D" Thread Miller
LANDIS: 2½" single head horiz. threading machine
LEES-BRADNER: #40A Thread Miller
LEES-BRADNER: CT-36 Thread Miller chucking type, 13½" hole.
MURCHEY: #22 Horizontal threading and tapping machine, ½" to 2½" dia. capacity, single spindle
NATCO: Vertical Tapper 16 spindle

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BAIRD: 4-slide wire former
HEENAN & FROUDE: Wire forming, 4-slide machines (new)

MISCELLANEOUS

OPTICAL PROFILE GRINDER, Wickman, New
AUTOMATIC SCREW MACHINE, Wickman, Single Spindle, 7/16", New
CENTERING MACHINE: Sundstrand, 44" Double End.
CUTOFF: Campbell, abrasive 425 Cutalator 4½" dia. Capacity
RACK CUTTING MACHINE: Sykes 12" to 36" length capacity (New)
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27x48 LEBLOND, 1941

MILLS

No. 2 BROWN & SHARPE, Univ., 1941
No. 2 BROWN & SHARPE, Light Type
No. 2 CINCINNATI, Univ. HSDT, 1943
No. 2 CINCINNATI, Vert. HSDT, 1943
No. 08 CINCINNATI Vert., Rotary Table
No. 1-12 CINCINNATI
No. 2HL KEARNEY & TRECKER, Plain
No. 3VG REED PRENTICE (2)
24"x36" INGERSOLL Duplex, 1942
No. 3-36 CINCINNATI Production
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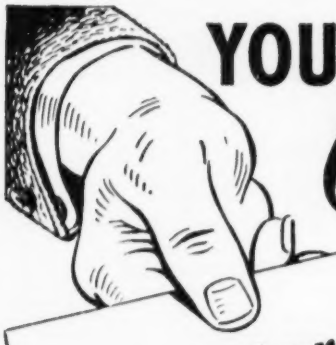

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Brown & Sharpe (5) Model 00G, ⅜" capacity.
Ceco Screw Machine ⅜" capacity.
Cleveland, Model AA-11, Serial #36586.
Cleveland Model B. Serial #42618/843
Conomatic 4 Spindle, Serial #2309FF, 1½"

BORING MILLS
Bullard 24" V.T.L., Spiral Drive
Bullard 8"—8 spindle, Multi-Matic
Cleveland 2½" Bar Capacity
Giddings & Lewis #32, 3" #25, 2½" Bar
Kings 42", 72" Vertical 2 rail heads
Niles-Bement-Pond 4", 4½" Bar, 60" Vert.
Niles-Bement-Pond 60" Vertical
New 3" Horizontal Boring Mill

DRILLS AND RADIALS
American 6'x15" Universal, 4'x13"
Baker No. 321 Vertical Boring & Drill
Bausch Multi-spindle
Buffalo #2 Motor Spindle, #16—4 Sp.
Buffalo: Power No. 41, No. 42
Canedy-Otto 21" Sliding head New
Cincinnati Bickford 6'x15" col.
Edlund 8" Model 2B, Sliding Head
Natco #12 20 spindle drill
24" Sibley Sliding head
New Geared Box Col. Drills 24'
Foote-Burt #25 3" capacity
Leland Gifford 2 LMS, 3 MS
Leland Gifford No. 2—4 Sp. Hyd. Feeds
Sigourney 2 spindle

ENGRAVERS
Gorton #1A, ME, 1D, 3U, Deckel G1L, G1, G2
Taylor-Hobson 3 dimensional Pantograph
New, 3 dimensional Deckel type

GEAR EQUIPMENT
Barber-Colman Mod. SHS. Sharpener
Barber-Colman #2, #12 (3)
Barber-Colman Hobber Type 5
Brown & Sharpe #3 Gear Mill, 26" Cap.
Cleveland Rigidhobber Mod. 140.
Fellows High Speed Shapers 712, 725, 71, 7
Fellows #20M Redliner, Flather 72" Cutter
Gleason #2 Surface Hardener, No. 3 Gear Tester
Gleason #3 Spiral, #3 Straight Bevel
Gould & Eberhart 36" Cutter
Michigan Gear Finisher 24" cap., 862-24A
Mikron No. 79 Gear Hobbers
National Broach Red Ring Lapper, Finisher
Schuchardt & Shutte #1 Hobber

GRINDERS, SURFACE
New 9x24" Hyd. Feed, 10x18", 6x18"
Abrasive 8x24", #33 Vert. & #34
Blanchard #16, 26" Mag. Chuck
Brown & Sharpe #5, #2 with Chuck
Heald 22—12" chuck, Arter 12", Covel No. 1S
Portman 12" Chuck Rotary
Pratt & Whitney 12x36" Vertical
Reid #3, 11"x36"
Taft Pierce #1 Precision

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8 and 9 oz. Injection Moulders
125 Ton Southwark Press, Bed 96"x30". 30" stroke, 2 to 4 ft. opening
150 Ton Triple Action HPM Press
250 Ton Watson & Stillman 28x24"
300 Ton Watson & Stillman 24x29"
300 Ton Watson & Stillman 20"x20" Platen 8" St. 19" opening
600 Ton Williams & White 42"x60"
800 Ton Williams & White 42"x60"
800 Ton W&S Hobbing Press

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GRINDERS, MISCELLANEOUS
Brown & Sharpe #2 Universal 14"x28", #3 Univ.
Brown & Sharpe #5. 3"x18" Cylindrical
Brown & Sharpe #13 Universal Tool & Cutter
Bryant #5 Internal, chucking
Cincinnati 6x18" Hyd. #4—Centerless—#2
Gardner Disc Grinder 30"—15 H.P. Motor
Grenby Models 1G1 & 1G2—Internal
Gorton Ped. Type Tool Grinder Mod. 375-2
Heald #73 Internal Centerless, Sizematic
Heald 72A3 Int. Centerless Sizematic
Landis 6"x30" Type C Cyl., 10x24 Univ. 12x30
Lempco 54" Swing
Norton #2 Tool & Cutter, No. 1 Tool & Cutter
Norton Type C 6"x18" Semi-Automatic cyl
Norton 10"x18" Type C cylindrical, 6"x30" Cyl.
Norton 14"x96" cyl., 16x48 Univ.
Norton Roll Grinder 50"x28'
Oliver #510 Drill Pointer
Pratt & Whitney Radius Model R6
Sellers 6-G Drill Grinder
Sellers 6G Tool, K.O. Lee tool
Van Norman #666 Crankshaft

LATHES
American 12"x30", Bridgeford 36"x20", 32"x16'
Boyes & Emmes—24" Geared Head
Bradford 16"x36"
Gisholt Simplimatic 18"x16½, 2 Tables
Hendey 12"x42" and 12x30", 1941, 14" Yoke
LeBlond Regal 10"x3' bed, 13x42"
LeBlond 25/50x96" Gap, Late type.
Lipe-Carbo 12"x18" (2)
Lodge & Shipley #3A, Duomatics
Pratt & Whitney 16"x60, 10"x20", 16"x36
Monarch Magna-matic 14"x54"
New 16, 18, 20", 28" Immediate Del.
New Tool Makers 10x24", South Bend 9"
Rivett Model 918 Precision, Mod. 715
Putnam, Sliding Gap 22"/46"x92"
South 13"x5' Q.C.G.
Sundstrand 8x15", 15' Stub
Wickes 32"x35' Geared Head

MILLS, PLAIN, UNIV. PROD.
New #2, Univ., Dividing Hd.
Brown & Sharpe #0 Omniversal, #000 Production
Brown & Sharpe #2B Plain, No. 2, 3A, 21 #2L
Cinn. 08 Rise & Fall
Cinn. No. 3, 4 Plain Spd., 18" Manufacturing
Kent Owens IV, 1-8, 1-14, 1M
Kempsmith #1 Pl., Vert. & Div. Hd.
Milwaukee 2H Universal
Milwaukee #2B, Plain & Univ.
Sundstrand #00, 0, Rigidmils
Sundstrand #3A Rigidmil with copying Attach, 33
Van Norman #2L Univ., Dividing Head
Van Norman No. 12

MILLS, VERTICAL
Cincinnati (2)—1-18 Plain Automatic
Cincinnati #3, #4 hi-power, 08 Vertical
Cleveland No. 1, table 8"x32"
Gorton 8D Super Speed
Morey #12M Profiler, 2 sp. #2 Maximiller
Reed Prentice Vert. Mill & Die Sinker Mod. 3VG

PRESSES
Bliss No. 1 Double Action Drawing Presses
Bliss 650 Hi-Production Presses
Bliss 18, 19, 21, OBI, 58, 62, 162, OB
Bliss 4½ Double Action, Roll Feeds, Cam (2)
Bliss #78½, 330 Ton SS, Bliss 74½
Bliss 5-48 Dbl. 32x48" bed, Cushion
Hamilton 850 Ton S.S. Bed 27x48
Hamilton 110 FM Die Tryout Press
New 85, 60, 55, 30, 20, 15, 10, 5 Ton O.B.I.
Niagara Herning, 15 Ton—Toledo 32 Ton Honing
Niagara A1¾, O.B.I., Niagara No. 27
Stokes Tablet Press, type R, Late, Model F
Toledo 92½c Double Crank 43x23" bed
Toledo 29 Double Action Cam
V. & O. #102 O.B.I. Reducing
Walsh No. 3 O.B.I. 23 Ton, L1 #3
Z & H #4½, O.B.I. 20 Ton

TURRET LATHES
Bardons & Oliver #2, 3, 5, 7, Bar Feed
Brown & Sharpe, #2 Hand, #10, 11
Foster #2B 2½ Cap. Morey #2G Late
Gisholt 2L, Cross Slid. Tur.
Gisholt #5, Bar Feed, Plenty of Tools
Gisholt 4R—9¼" hole in spindle
Libby 1 HS with threading att.—3R, 4R
Oster 601 WD. #2 Simmons Microspeed
Warner & Swasey #1, 1A, 2, 2A, 3, 4, 5

MISCELLANEOUS
Band Saw: New Kalamazoo & Johnson
Bolt & Pipe Threader: Landis, Oster-Williams
Broach: New 6 Ton, Horizontal, 11 Ton, Vertical
Hacksaw: Peerless 6"x6", Racine 6"x6"
Jig Borers: New Swiss
Keyseater Davis, Baker
Pipe Bender, Kane & Roach, Vari-drive
PLANER: Niles-Bement-Pond 36x36'x10'; Gray 24"x24"x8', Detrick & Harvey 40x90"
Rotary Table: Cincinnati, power take-off
Saw: Shaping 6x6", 13x13"
Scrap Cutters & Granulator: Ball & Jewell
Shapers: 24" Rockford, 24", 28" New, Vrt.
Shears Power, 10' 3/16", 10" x 16 gauge

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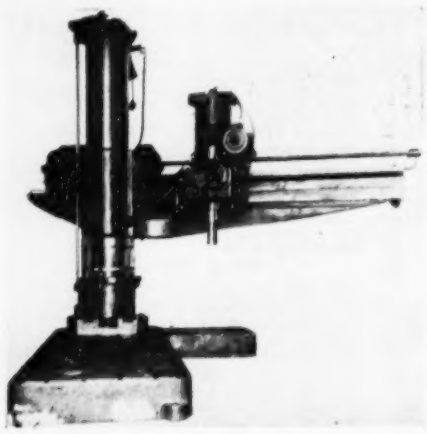

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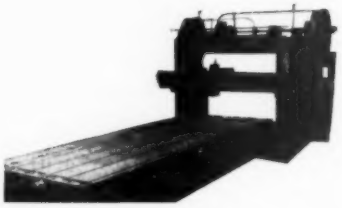

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Friction Saw Ryerson 52" Blade 45 H.P. Motor
2" Acme Forging Machine
4-36 Cincinnati Hydromatic 1942
D-6 Colburn Heavy Duty Drill Press
20x37 Fay Automatic Lathe, 1943
No. 31L Ex-cell-O Thread Grinder, Serial No. 2361
24' Rockford Hydraulic Shaper Late

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COLBURN 72" 2-swivel heads, rapid traverse, M.D.
NILES 53" 2-swivel heads, P.R.T., M.D.
NILES 100", 2-swivel heads, P.R.T., M.D.
NILES 120",.2-swivel heads, P.R.T., M.D., late.

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LEES BRANDER model HT, 12"x36" centers, late.
MOREY 12"x30" centers, late type.

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INGERSOLL 30"x24"x12' Adj. Rail Slab; M.D.
INGERSOLL 32"x24"x16' Planer type; 2 hds; M.D.
TAYLOR & FENN M-80 Duplex Spline; late.

MILLING MACHINES—Plain

CINCINNATI I-18 Automatic; timken; late type.
KEARNEY & TRECKER Mod. 2HL, M.D., late.
KEARNEY & TRECKER 4H Plain, timken, late.
ROCKFORD #3 Rigid Mill, motor drive.
STARR #2 table 13"x55", late type.

MILLING MACHINES—Universal

CINCINNATI #3 Univ. dial type, timken, M.D.
KEMPSMITH #2 Univ. Maxi-miller; M.D.
RICHMOND #2 light type, late.

MILLING MACHINES—Vertical

AUTOMATIC 12"x16" 2-spindle Vert. profiling; late.
CINCINNATI 0-8 vertical; timken; late type.
KEARNEY & TRECKER 3H Vert., timken, late.
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NILES BEMENT POND 72"x72"x30"; 4 hds; rapid traverse; M.D.
NILES 48"x48"x10' double 4 hds; PRT; M.D.

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CAMPBELL #401 Abrasive Cut Off, late type.
ESPEN LUCAS #620 30" cap. H.S. cold saw, late type.
PEERLESS 6"x6" hack saw; auto. feed; late type.

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DILL 18" slotter; motor drive.
DORFLINGER 20" Universal heavy duty; NEW.
LYND FARQUHAR 26" openside; M.D.
MUIR 6" Vertical; motor drive.
NEWTON 15" slotter; M.D.
PRATT & WHITNEY 6" and 10" Vertical; M.D.

LATHES—Turret

WARNER & SWASEY 2A Univ. Preselector head; late.
GISHOLT 2L High Production, Timken, M.D., late.
GISHOLT 1L Univ. saddle type, Timken, M.D., late.
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BORING MILL, 72" N.B.P. vertical
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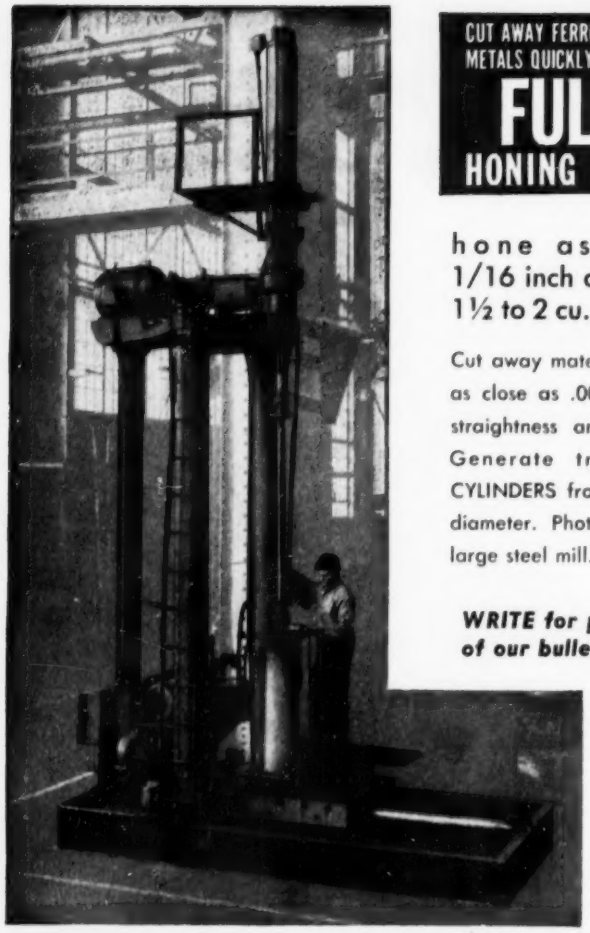

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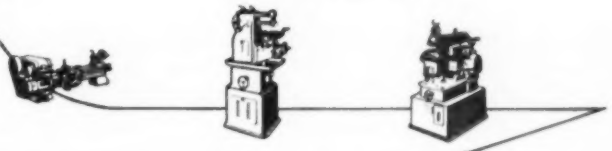

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9	24-28-32-40
10	28-30-36-40-48-54
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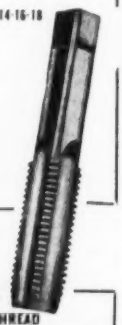

HIGH SPEED LEFT HAND TAPS

SIZE	THREAD
0	80
1	56-64-72
2	56-64
3	56
4	32-36-40-48
5	40-44
6	32-36-40
8	32-36-40
10	24-30-32-40
12	24-28-32
1/4	20-28-32
5/16	18-20-24-28-32

SIZE	THREAD
3/8	16-24-32
7/16	14-20-28
1/2	12-13-20-28
9/16	12-18-20-24
5/8	11-12-18-20-24
11/16	11 16 24
3/4	10-16-18-20
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7/8	9-12-14-18-20
1	8-12-14-16-18-20
1-1/8	7-12
1-1/4	7-12-16-18

SIZE	THREAD
1-3/8	8-8-10-12-16-18-20-24
1-7/16	8-10-12-14-16-18-20
1-1/2	8-8-10-12-16-18-20
1-9/16	8-10-12-16-18-20
1-5/8	8-10-12-14-16-18-20
1 11/16	8-10-12-14-16-18-20
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1-13/16	8-10-12-14-16-18-20
1-7/8	8-10-12-14-16-18-20
1-15/16	8-10-12-14-16-18-20
2	4-1/2 - 10-12

• *SPECIAL AND LEFT HAND DIES IN STOCK*

Prices on Application. We are always adding new sizes

NOTE: Oversize - Undersize - Metric - 64th and 32nd Size Taps Available for Quick Delivery

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From the *American Machinist* Library of *Tips for Top Shop Men*

SOME wag said long ago that it isn't smart to step on other men's hands as you go up the ladder—you may need their help coming down. It's just as true that the man who makes his way up by slipping a knife in the back of the man above, spends his time up there ineffectually because he's always got one eye cocked over his shoulder, watching for the knife.

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NILSON FOUR-SLIDE

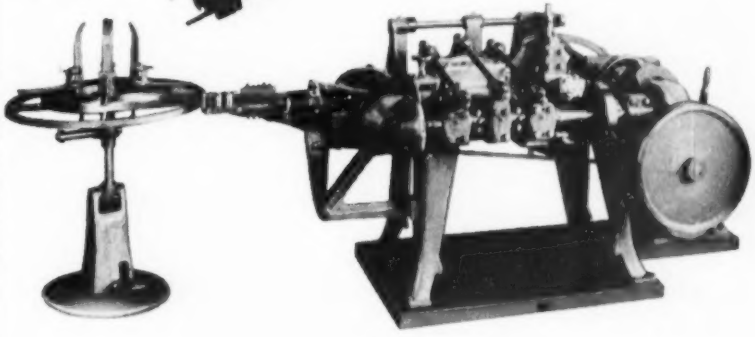
It's easy to get
HIGH PRODUCTION
. . . and UNIFORMITY, too!

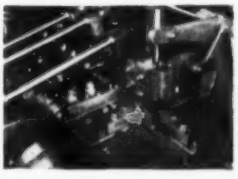
Wire and Ribbon Metal
FORMING MACHINES

UNIFORMITY in automatic production doesn't come by chance! In the case of wire and ribbon stock forming on NILSON 4-SLIDES, *it means control of the material from the coil to the final form.*

Parts, such as illustrated, are produced to tolerances of .002 at critical dimensions. Dies and forming tools, once installed (faster and simpler with NILSON'S open construction) maintain close tolerances for short and long runs. One machine! One set-up! Increased production! Maximum uniformity!

Model SF3 NILSON 4-SLIDE, shown below, with No. 51B Tilting Stock Reel, is a complete unit that can be set-up in any convenient location.





Close-up of the NILSON forming section with the built-in Horizontal Press to the left. This design eliminates secondary handling and insures product uniformity because the sequence of stamping and forming is automatically controlled.

Close-up of the NILSON feed mechanism . . . capable of feeding wire and ribbon metal to tolerances of .001. Another important element in insuring product uniformity. Positive control is maintained over the material regardless the length of feed.

Range of sizes

Wire Forming
1/32" through ½" wire. Feeds up to 32".

Ribbon Stock Forming
1" through 3½" wide material. Capacity of press section 5 to 30 tons; 50 to 75 tons in heavy duty types.

For specific recommendations — send details of your operation.

THERE'S NOTHING LIKE A NILSON

NILSON has been specializing in Forming Equipment for over 50 years.

THE A. H. NILSON MACHINE COMPANY
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Automatic Chain-Making Machines • Automatic Staple Forming Machines • Wire and Stock Reels • Foot Presses • Wire Straightening Equipment • Slide Feeds for Presses

ARTER *Precision*

ROTARY SURFACE GRINDERS
for Jet and Piston Engine Airplane Parts

THE MODEL "A"

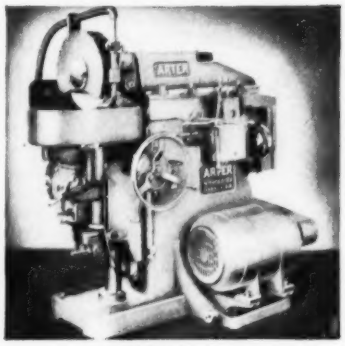
Model "A". Grinding is done on the periphery of the wheel, the work being held by a rotating magnetic chuck. Two sizes: 8" and 12" diameter.

THE MODEL "B"

Model "B". Four chuck capacities — 20", 24", 30" and 40". These machines are mainly hydraulically operated. Great vertical capacity. Work table can be tilted.

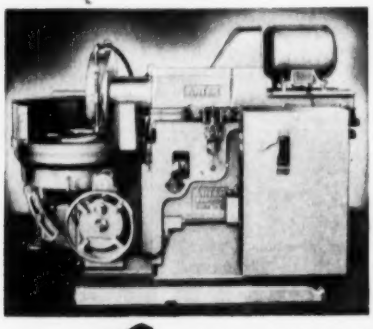
THE MODEL "D"

Model "D" — two chuck capacities — 12" and 16". A 7½ h. p. motor, precision balanced, mounted on the wheel slide delivers full power by multiple vee belts, to the wheel spindle.

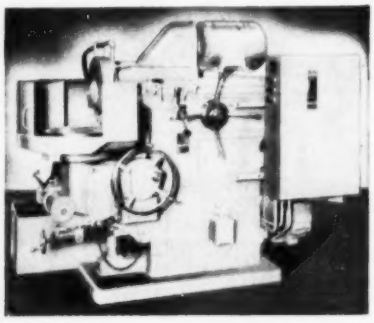


MODEL "A"

MODEL "B"



MODEL "D"



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WORCESTER 5, MASSACHUSETTS

From the *American Machinist* Library of *Tips for Top Shop Men*

BUILD a good reputation in your community. Morale and efficiency usually are high in the plant that is known as "a good place to work."

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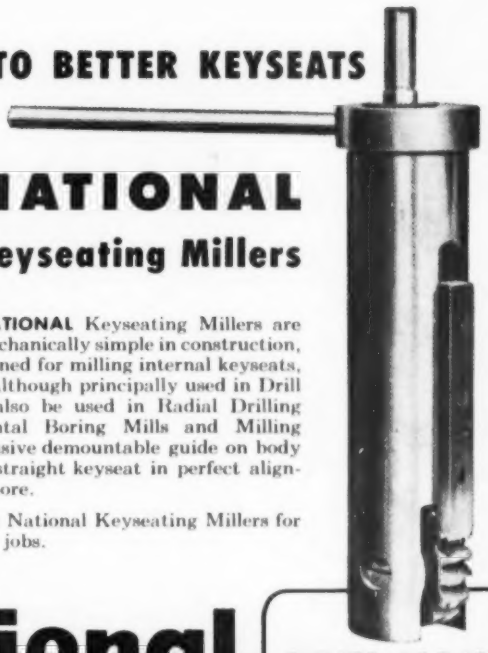
THE KEY TO BETTER KEYSEATS



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Keyseating Millers

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You can depend on National Keyseating Millers for all your keyseating jobs.

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CINCINNATI 22, OHIO

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16 INCH • 12 SPEED

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ONLY **ONE** *MODEL* • *ONLY* **ONE** *SIZE*

- Feed provided by separate rod — lead screw is used only for thread chasing

Complete regular equipment includes thread indicator.

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FRICTION SAWING

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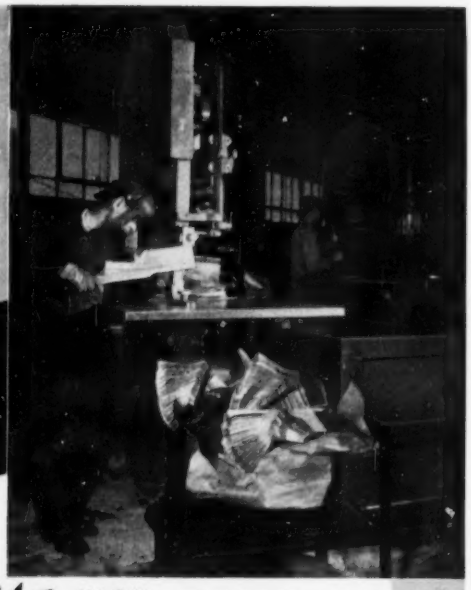

The ease and speed with which these machines cut through sheets of soft or hard steel, non-ferrous metals, plastics and many other materials provides marvelous opportunity for increasing production and lowering costs. And for cutting formed parts, or trimming castings, there's nothing to compare with it, for the down-drag of the saw is so negligible that in most cases no jig or rest whatsoever is required. Get the complete facts, NOW!

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The TANNEWITZ WORKS

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BE SURE in your own mind why you refuse to consider a new method, a new machine, or a new man. Are you envious because you didn't think of the method, or are you too lazy to work out the change? Are you enamored of an ancient clonker, or are you afraid to meet present standards? Are you jealous of the new man, envious of his youth or experience, fearful of your job?

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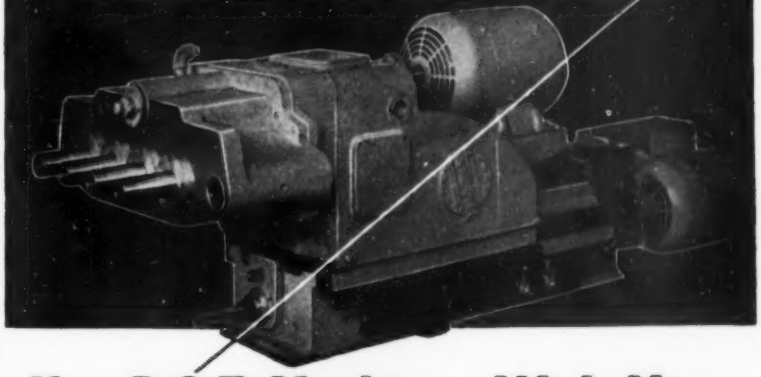
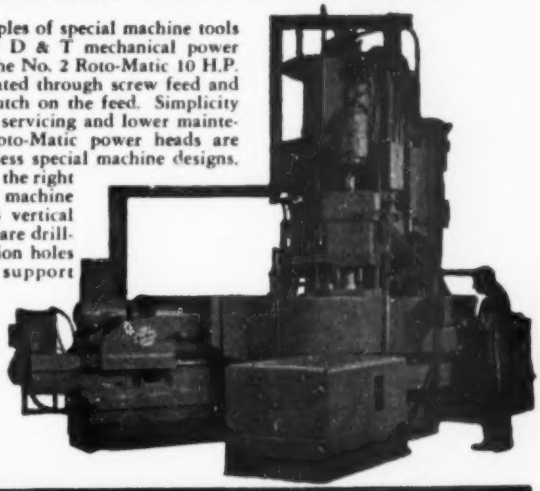
For High Production and Low Maintenance Costs *



Use D&T Machines With New Mechanical Power Heads

Here are two good examples of special machine tools designed and built with D & T mechanical power heads. Shown above, is the No. 2 Roto-Matic 10 H.P. head. All sizes are operated through screw feed and have overload release clutch on the feed. Simplicity of design makes for less servicing and lower maintenance costs. D & T Roto-Matic power heads are readily adapted to countless special machine designs. For instance: Machine to the right is a 6 station indexing machine with 3 horizontal and 3 vertical power heads. Operations are drilling and reaming suspension holes and king pin holes in support arms for power heads.



Free Data

Is available on the complete line of D & T machines. Ask for Bulletin 1000.

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Davis & Thompson Company

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From the *American Machinist* Library of *Tips for Top Shop Men*

DESPISE the political maneuver called "damnation by innuendo". The apparently innocent question, "Does Johnson beat his wife?" is just as harmful to Johnson in the long run as your positive statement that he does. Watch remarks like "Is Smith slipping?", or "Is Jones' health poor?", unless you have a malicious desire to see the thing happen.

precision *beyond question*

The requirements exacted of surface grinding machines leave no room for variation. Precision and tolerance control must be built-in. Through the years Grand Rapids Grinders have demonstrated the highest quality and unquestioned dependability of performance. Upon this record they have been accorded world-wide acceptance as standard of the industry. Here is precision beyond question.

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GALLMEYER & LIVINGSTON

MANUFACTURERS OF SURFACE GRINDERS, CUTTER AND TOOL GRINDERS, TAP AND DRILL GRINDERS

New Britain Builds the . . .

CAM OPERATED Boring Machine

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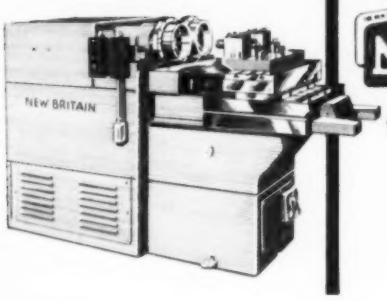
Cam actuation reproduces tolerances and finishes with absolute certainty piece after piece, hour after hour, day after day.



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New Britain-Gridley Machine Division, New Britain, Connecticut

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Turns, grooves, faces, bores with automatic accuracy on TIMKEN® bearings

A PLATEN type model, Gisholt's Simplimatic Automatic Lathe can accommodate a wide variety of tool arrangements, every slide with its own drive, rate and direction of feed, but all accurately driven and timed with the spindle. And because all machine functions are automatic, one man can normally operate several machines.

To maintain its incredible precision, Gisholt mounts the spindle and driving gears on Timken® tapered roller bearings. On the spindle, Timken bearings have a greater capacity for tool load because line contact between rollers and races provides load-carrying capacity to spare. Timken bearings in the headstock maintain alignment, help gears mesh accurately with less wear. A smooth flow of power is assured over a wide range of speeds and feeds.

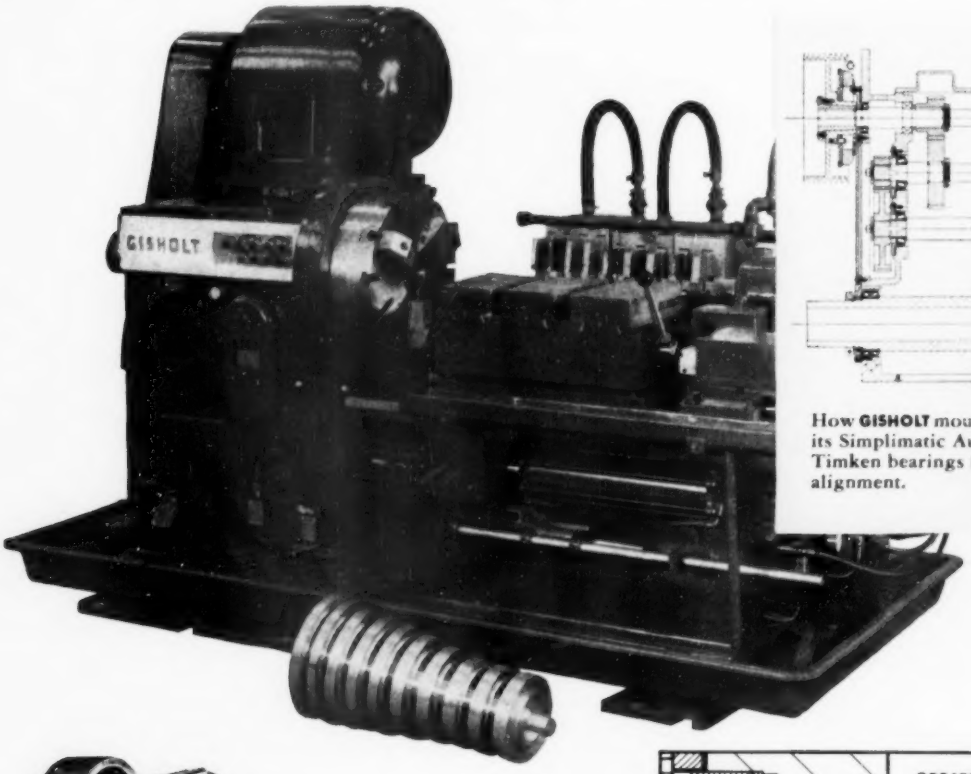
Timken bearings, because of their tapered construction, permit preloading to any desired degree, eliminating chatter. They are made for exacting spindle applications. "Double Zero" Timken bearings are available with maximum run-out tolerances of 75 millionths of an inch.

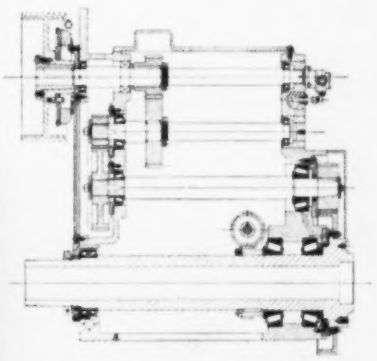
Timken tapered roller bearings on the spindle take radial and thrust loads in any combination, assuring spindle rigidity. Their true rolling motion and incredibly smooth finish practically eliminate friction. Wear is minimized and precision is maintained throughout the machine's moving parts.

No other bearings can give you all the advantages you get with Timken tapered roller bearings. Make sure you have them in the machines you buy or build. Look for the trade-mark "Timken" on every bearing. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".

TIMKEN BEARING EQUIPPED

This symbol on a product means its bearings are the best.

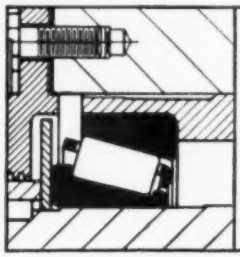




How **GISHOLT** mounts the spindle on its Simplimatic Automatic Lathe on Timken bearings for positive, rigid alignment.

TIMKEN

TAPERED ROLLER BEARINGS



GREATER ACCURACY FOR HIGH SPEED SPINDLES!

Timken bearings in new, semi-flexible mounting insure uniformly high spindle accuracy under varying speeds, loads, temperatures. It permits radial expansion without excessive preloading. Developed by the Timken Company, it's tested and proved. Write for full information.

NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL ◇ AND THRUST ⊡ LOADS OR ANY COMBINATION